Railway Age

DAILY EDITION

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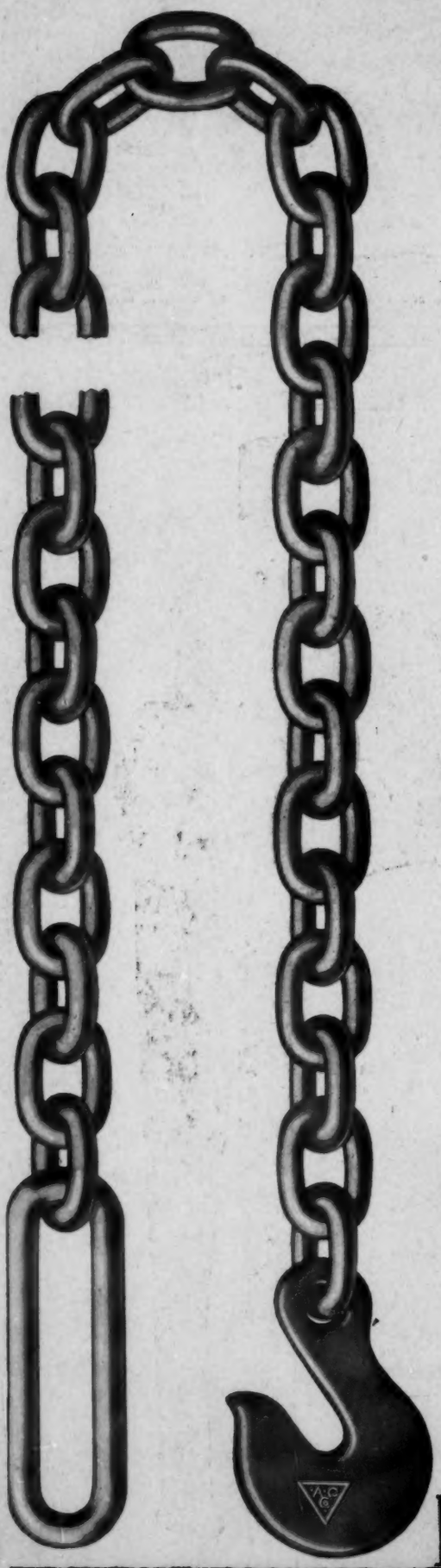

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RAILWAY SWITCH CHAIN

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Railway Age

DAILY EDITION

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WE GUARANTEE that of this issue, 15,000 copies were printed; that of these 15,000 copies, 13,480 were mailed to regular paid subscribers to the Railway Age and the Railway Mechanical Engineer; 140 were mailed to advertisers, 280 were provided for counter and news companies' sales, new subscriptions, bound volumes, samples, copies lost in the mail and office use; and 1,100 copies for distribution at Atlantic City.

THE RAILWAY AGE is a member of the Associated Business Papers (A. B. P.) and of the Audit Bureau of Circulations (A. B. C.).

The paper shortage is becoming more and more acute. It was only with the greatest difficulty and at an exorbitant expense that we were able to secure sufficient paper to publish the *Daily* this year. The usual number of copies will be provided for distribution at Atlantic City, but the indications are that there will be a greatly increased attendance of both railway and railway supplymen. When you have finished with your copy of the *Daily*, therefore, do not throw it away or destroy it. If you do not care to preserve it for future reference, please pass it on to your neighbor who may not have seen a copy, or return it to the *Railway Age* office. We feel sure that our friends will co-operate with us in helping to make the best possible use of each copy of the *Daily*.

Don't Destroy Your *Daily*

In former years the mechanical associations have had difficulty in securing improvements in the accommodations on the pier. It is therefore gratifying to note that during the last year the Convention Hall has been remodeled, greatly improving its acoustic properties, and the balcony in the Main Hall has been rebuilt to provide an attractive space for exhibits. The owners of the pier and the officers of both the Mechanical Section and the Railway Supply Manufacturers' Association are to be congratulated on the changes. The need for a larger number of exhibit spaces was clearly shown last year by the fact that in numerous instances booths were shared by two companies. The additional space in the balcony has helped to relieve the situation somewhat, although so many more companies desired to exhibit this year that the shortage of space is even more pronounced than last year. The difficulty of hearing in the Convention Hall has proved extremely annoying at previous conventions and no doubt has checked the free discussion of the papers. With these two improvements this year's meeting should fulfill its early promise and should rank among the most successful of the June conventions.

Improvements On the Pier

Many of the more important industries are fully alive to the necessity of attracting technical men to their organizations and often go so far as to maintain special departments or officers to get in touch with the senior students at engineering colleges and place before them the advantages of becoming affiliated with their organizations. In the past many college graduates have been attracted to the mechanical departments of the railways and have entered the special apprenticeship courses which were maintained in most of them. The special apprenticeship gave the college graduate a general training in the mechanical department affairs, based primarily upon a good course in shop work and repair work. The National Agreement has not only made no provision for allowing technical graduates to gain a shop experience but has even made it impossible for them to take a regular apprenticeship course by limiting the maximum age at which the apprentices will be enrolled to 21 years. Few, if any, technical graduates leave college at this age. It has often been suggested that the railroads could recruit their own technical graduates by selecting the brighter and more capable apprentices and rewarding them with special scholarships in technical courses. This is good but it will take a long time to work it out satisfactorily and meanwhile under the present conditions the railways will be prevented from recruiting college graduates in the mechanical department. The matter is of such vital importance that it would seem that it should receive some consideration at the convention this year. It will be a difficult problem to solve, but the sooner it is tackled the better.

College Men On the Railroads

The locomotive orders which the railways of the United States have placed thus far this year show that they are strongly disposed to increase their facilities as rapidly as they can. On January 1, 1920, the three large locomotive companies of this country had on their books orders for only 99 locomotives from the standard gauge railways of the United States. In other words, they were practically out of domestic orders. From January 1 to May 19 these three companies received orders for a total of 1,166 locomotives from the railways of the United States. Assuming that none of the orders which they had on their books at the beginning of the year or which they had received since then had been canceled, the total orders which they have filled this year and which they still had unfilled up to May 19 was 1,259. This is not a large number of orders for these three companies to have. In the four years 1910 to 1914, when business was good, they built for the railways of the United States 10,541 locomotives, or an average of 2,635 a year. On the other

Increase of Locomotive Orders

hand, during the six years 1914 to 1919, inclusive, they built for the railways of the United States only 8,540 locomotives, or an average of only 1,423 annually. Their production for domestic service in 1919 was only 946. Compared with the records of recent years, therefore, the orders that have been placed thus far this year are substantial, and if the Interstate Commerce Commission renders a satisfactory decision in the rate advance case it is probable that numerous roads which have not yet entered the market will do so. There is great need for the placing of much larger orders this year, for most of the railroads are obviously very short of power.

Automatic Turning Machines

It is almost a truism to remark that the development of automatic turning machines, as well as grinding machines, has reached its highest state in the automotive industry. But railway men have learned to profit by the experience of others and several automatic machines of different types developed for railway work can be seen in operation at this convention. These machines, like all other machine tools, have practically doubled in price in the past four years, but in spite of this, their installation in railway shops is not only a good investment but a necessity, due to the scarcity and high cost of labor as well as the imperative need of getting motive power and rolling stock into good serviceable condition before next winter. The automatic machine is really a combination of several machines, each one performing a given operation and using one tool arrangement. The operator's duties are to position each piece accurately at the loading station, remove each piece as the cycle of operations is completed and see that the machine runs continuously without accident. Occasional checking of the work is advisable. Automatics are now made with ample power to remove stock rapidly when enough cooling compound is used, and any desired accuracy up to .001 in. can be obtained. The machines are unequaled for the rapid, accurate production of duplicate parts. The use of automatics has been extended to the manufacture of many parts previously made on other machines. For example, rings for the joints between injectors and injector pipes were formerly made of brass and ground in by hand. It has been found possible on one road to effect a saving of 75 per cent by making these rings on a heavy automatic out of steel tubing, the flat joints being finished on a grinding machine equipped with a magnetic chuck. The different parts that can be made are too numerous to mention and such jobs as the above, taken in the aggregate, show the possibility of large savings by the introduction of automatic machines in railway shops.

Invest in Engine Terminals

Money spent on enlarging and modernizing engine terminals will not only reduce operating and maintenance costs, but it will produce—it will add something to the capacity of the railroad. If the time required to turn 24 locomotives can be reduced an average of one hour per engine by means of improved terminal facilities, the investment in these facilities will, in itself, be equivalent to the addition of a locomotive to the service. Is this always taken into consideration? Is the value of a locomotive per hour generally recognized? A locomotive is of no value to a railroad when it is not available to haul trains, and no matter how powerful or well designed the locomotive may be, it is useless to the road as long as it is held out of service. The design and equipment of engine terminals has more to do with the time that a locomotive is available for service than any other single factor, and consideration of this alone should lead mechanical executives to put greater emphasis on the need for modern engine terminals. A modernized terminal implies a track layout that will not cause a single hitch in the movement of engines to and from the roundhouse, an ash pit with adequate trackage, water spouts located at a number of convenient points, a coal chute so designed that engines can be coaled promptly, and a motor-driven turntable that is large enough to accommodate the longest locomotives without difficulty. Many additional features are essential to modernized terminals, but these are some of the factors that tend to reduce the time required for turning power. If it were possible to cut in half the time now required for turning locomotives on all railroads it would be equivalent to placing at least 10,000 additional locomotives in service. The return from money spent on engine terminal improvements is out of all proportion to the investment required.

Where Progress Is Slow

Apparently there has never been a time when railroad men were so ready to adopt improved appliances as they are at present. In looking over the exhibits one cannot fail to note the numerous devices that were classed as innovations last year, but are now looked on almost as standard equipment. Considering the strides that have been made in perfecting new devices, is it not surprising that, with its wonderful possibilities in increased capacity and efficiency, the matter of reducing the dynamic augment of locomotive drivers has received so little attention? The question has been discussed by the mechanical associations and by railroad clubs, but there has been no interested inventor or manufacturer to keep the advantage of lightening the revolving and reciprocating parts in the minds of railroad men. The difficulties are not insuperable. What is needed is an active realization of the saving that can be effected by reducing the dynamic augment and a determination on the part of the mechanical officers to make it an accomplished fact.

Making Steam

Is heat transmitted through the body of water in a locomotive boiler by conduction or convection? The question is of more than theoretical interest because it has a direct bearing on locomotive efficiency and capacity. If the heat absorbed from the surfaces of the tubes and firebox sheets simply traveled through the water as heat does through a piece of metal, the circulation of water in the boiler would not be an essential factor further than for the beneficial effect derived from the scouring action exerted on the sheets and boiler tubes, which tends to keep these clean and free from scale. But by far the greatest amount of heat taken up by water in the process of steam making is by means of convection; that is, it is literally conveyed to the body of water by particles of water coming in actual contact with the heating surfaces. This is why circulation is of paramount importance in a locomotive. Rapid circulation multiplies the water particles coming in actual contact with the heating surface and consequently increases the quantity of heat absorbed per square foot of heating surface. Any effective means for promoting boiler circulation is therefore equivalent to increasing the area of the heating surfaces without a corresponding increase in the weight of the locomotive. Boiler circulation as a means for increasing the capacity and evaporative efficiency of the locomotive boiler reserves greater attention.

Keeping up with Germany

Not so long ago, about the strongest argument in favor of superheated steam was its almost universal use on German locomotives. The theoretical advantages of superheating steam were appreciated, but American railroads were timorous about applying superheaters until their successful application was demonstrated elsewhere. Today the situation is much the same with respect to locomotive feedwater heating. Its advantages are pretty well understood, but as yet the feedwater heater has not taken hold and discussions on this topic are confined largely to the realm of theory, The practical side of the question is being evaded and the tendency is to let some one else try it out first. As with the superheater, this is exactly what is happening. Every locomotive now being built in Germany is equipped with a feedwater heater and Germany is building more locomotives than ever before. Armor plate mills are now rolling locomotive boiler plate and Germany has actually a greater number of locomotives than before the war. There is no mystery about feedwater heating; boiler efficiency is increased more than one per cent for every 11-deg. rise effected in the temperature of feedwater, and practical means are available for utilizing the heat in exhaust steam and waste gases to raise feedwater temperatures 100 deg. or more on any locomotive. If the feedwater heater has become a practical operating factor in Germany, can it not be made so in this country?

Don't Be a Pessimist

During the past year there has been a widespread feeling of discouragement as to the present labor situation, which has affected the mechanical departments of American railroads no less than all industries. Not only has this related to the present situation, but the utmost pessimism has been expressed as to the probable future development of tendencies which, at first glance, seem to be leading toward chaos. The present conditions are not primarily due to inherent unreasonableness on the part of any class of the country's population. They are due to a general failure by the individual to understand his responsibility and an unwillingness to accept his share in the price of the victorious warfare in which we have so recently participated. There is a shortage of many essential products. There is unrest bred of the complete disorganization of the course of industry and of the careers of many millions of individuals. The monotony of stable modes of living has become irksome and a desire for luxury has temporarily caused a distortion of vision. Hence, prices are now high, and they will continue to mount until individual stability and steadiness of purpose reassert themselves sufficiently to make possible a return of normal industrial efficiency. Then conditions will begin the process of righting themselves, and however slow this process may be no one, unless utterly devoid of faith in the American people, can doubt the outcome. There are signs that the process of readjustment has begun and there is every reason for a feeling of optimism as to the future. But if the course of the natural tendencies toward readjustment is to be undeterred the nation's industrial relations, by no means the least important of which involve the mechanical departments of the railways, must be guided by clear thinking devoid of all prejudice and by the principles of justice springing from a profound faith in the integrity of human nature. There is no place in the ranks of mechanical department officers for a cynic or misanthropist.

Programs for the Three Conventions

THE SESSIONS OF THE CONVENTION of Section III—Mechanical, American Railroad Association, will be held in the Greek Temple, on the Million Dollar Pier. The headquarters will be at the Marlborough-Blenheim Hotel.

The sessions of the convention of Section VI—Purchases and Stores, American Railroad Association, will be held in the Hippodrome, on the Million Dollar Pier. The headquarters will be at the Marlborough-Blenheim Hotel, where the office of the president, secretary and executive committee will be located.

The semi-annual meeting of the Association of Railway Electrical Engineers will be held at the Hotel Dennis on June 14.

The enrollment committee for Section III—Mechanical, and Section VI—Purchases and Stores, will be located in the entrance to the pier. Each member of these associations, immediately on arrival, should go to the enrollment booth, register and procure his membership button, showing his registration. Members will also be provided with badges for their families. Cards for registration will be furnished at the enrollment booth at the entrance to the pier.

Members of these two associations are requested to be in their seats promptly at 9.30 A. M.

Wednesday, June 9, 1920

SECTION III—MECHANICAL

Prayer	9.30 A. M. to 9.40 A. M.
Address of Welcome by Mayor of Atlantic City	9.40 A. M. to 10.00 A. M.
Address by the Chairman	10.00 A. M. to 10.30 A. M.
Action on Minutes of Annual Meeting of 1919 (M. C. B.)	10.30 A. M. to 10.35 A. M.
Appointment of Committee on Subjects, Resolutions, Correspondence, Obituaries, etc.	10.35 A. M. to 10.45 A. M.
Unfinished Business	10.45 A. M. to 10.50 A. M.
New Business	10.50 A. M. to 11.00 A. M.
Report of General Committee, including Announcement of Nominations for Members of Nominating Committee	11.00 A. M. to 11.15 A. M.
Discussion of Reports:	
Nominations	11.15 A. M. to 11.30 A. M.
Mechanical Stokers	11.30 A. M. to 12.00 M.
Modernization of Stationary Boiler Plants	12.00 M. to 12.30 P. M.

ENTERTAINMENT

10.30 A. M.—Orchestral Concert, Entrance Hall, Million Dollar Pier.

3.30 P. M.—Orchestral Concert and Impromptu Dancing, Entrance Hall, Million Dollar Pier.

4.30 P. M.—Tea will be served in Entrance Hall.

9.00 P. M.—Informal Dance including Special Features, Ball Room, Million Dollar Pier.

Thursday, June 10, 1920

SECTION III—MECHANICAL

Discussion of Reports on:	
Fuel Economy and Smoke Prevention	9.30 A. M. to 10.30 A. M.
Auxiliary or Safety Connections between Engine and Tender	10.00 A. M. to 10.30 A. M.
Design, Maintenance and Operation of Electric Rolling Stock	10.30 A. M. to 11.00 A. M.
Scheduling and Routing Systems for Locomotive Repair Shops	11.00 A. M. to 11.30 A. M.
Superheater Locomotives	11.30 A. M. to 12.00 M.
Individual Paper on "Snow Fighting Apparatus," by W. H. Winterrowd	12.00 M. to 12.30 P. M.

ENTERTAINMENT

10.30 A. M.—Orchestral Concert, Entrance Hall, Million Dollar Pier.

3.30 P. M.—Orchestral Concert and Impromptu Dancing, Entrance Hall, Million Dollar Pier.

4.30 P. M.—Tea will be served in Entrance Hall.

9.30 P. M.—Grand Ball, Ball Room, Million Dollar Pier.

Friday, June 11, 1920

SECTION III—MECHANICAL

Discussion of Reports on:

Locomotive Headlights and Classification Lamps	9.30 A. M. to 10.00 A. M.
Feed-Water Heaters for Locomotives	10.00 A. M. to 10.30 A. M.
Individual Paper on "Locomotives as a Big Investment," by George M. Basford	10.30 A. M. to 11.00 A. M.
Discussion of Reports on:	
Design and Maintenance of Locomotive Boilers	11.00 A. M. to 11.30 A. M.
Engine Terminals, Design and Operation	11.30 A. M. to 12.00 M.
Train Resistance and Tonnage Rating	12.00 M. to 12.30 P. M.

ENTERTAINMENT

10.30 A. M.—Orchestral Concert, Entrance Hall, Million Dollar Pier.
3.30 P. M.—Orchestral Concert and Impromptu Dancing, Entrance Hall, Million Dollar Pier.
4.30 P. M.—Tea will be served in Entrance Hall.
9.00 P. M.—Carnival Night with Special Features, Ball Room, Million Dollar Pier.

Saturday, June 12, 1920

The entire day has been set aside by Mechanical Section III to view the exhibits.

ENTERTAINMENT

10.30 A. M.—Orchestral Concert, Entrance Hall, Million Dollar Pier.
3.30 P. M.—Orchestral Concert and Impromptu Dancing, Entrance Hall, Million Dollar Pier.
9.00 P. M.—Musicale, Entrance Hall, Million Dollar Pier.

Sunday, June 13, 1920

3.30 P. M.—Sacred Concert in the Music Rooms of the Marlborough-Blenheim. The Albert Taylor Orchestra, New York City.

Monday, June 14, 1920

SECTION III—MECHANICAL

Discussion of Reports on:

Autogenous and Electric Welding	9.30 A. M. to 10.00 A. M.
Specifications and Tests for Materials	10.00 A. M. to 10.30 A. M.
Standard and Recommended Practice	10.30 A. M. to 10.45 A. M.
Election of Officers	10.45 A. M. to 11.00 A. M.
Discussion of Reports on:	
Repair Shop Layouts	11.00 A. M. to 11.20 A. M.
Amalgamation	11.20 A. M. to 11.30 A. M.
Standard Blocking for Cradles of Car Dumping Machines	11.30 A. M. to 11.40 A. M.
Standard Method of Packing Journal Boxes	11.40 A. M. to 12.10 P. M.
Establishment of a Coöperative Research Bureau	12.10 P. M. to 12.30 P. M.

SECTION VI—PURCHASES AND STORES

MORNING SESSION

Invocation	9.30 A. M. to 9.40 A. M.
Address of Welcome by Mayor of Atlantic City	9.40 A. M. to 10.00 A. M.
Response by J. H. Waterman	10.00 A. M. to 10.15 A. M.
Opening of Meeting by the Chairman.	10.15 A. M. to 10.30 A. M.
Action on Minutes of Annual Meeting 1919 (R. S. A.)	10.30 A. M. to 10.40 A. M.
Appointment of Committees: Resolutions Memorial	10.40 A. M. to 10.45 A. M.
New Business: Report of General Committee, including Announcement of Nominations for Members of Nominating Committee	10.45 A. M. to 11.30 A. M.
Discussion of General Committee's Report	11.30 A. M. to 12.30 P. M.

AFTERNOON SESSION

Discussion of Reports of Committees. 2.00 P. M. to 5.00 P. M.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS

ALL-DAY SESSION

Presentation of Progress Reports:
Committee on Trucks and Tractors
Committee on Electric Welding
Committee on Illumination
Committee on Train Lighting Equipment and Practice
Committee on Railway Stationary Power Plants
Committee on Electric Headlights
Committee on Electrification.
Committee on Electric Repair Shop Facilities and Equipment.

ENTERTAINMENT

10.30 A. M.—Orchestral Concert, Entrance Hall, Million Dollar Pier.
3.30 P. M.—Orchestral Concert and Impromptu Dancing, Entrance Hall, Million Dollar Pier.
4.30 P. M.—Tea will be served in Entrance Hall.
9.00 P. M.—Informal Dance with Special Features, Ball Room, Million Dollar Pier.

Tuesday, June 15, 1920

SECTION III—MECHANICAL

Discussion of Reports on:

Revision of Passenger Car Rules of Interchange	9.30 A. M. to 10.00 A. M.
Prices for Labor and Materials	10.00 A. M. to 10.30 A. M.
Depreciation for Freight Cars	10.30 A. M. to 11.00 A. M.
Arbitration	11.00 A. M. to 11.30 A. M.
Tank Cars	11.30 A. M. to 12.00 M.
Brake Shoe and Brake Beam Equipment	12.00 M. to 12.30 P. M.

SECTION VI—PURCHASES AND STORES

MORNING SESSION

Discussion of Reports of Committees.	9.30 A. M. to 12.30 P. M.
Discussion of Reports of Committees.	2.00 P. M. to 3.00 P. M.

AFTERNOON SESSION

Discussion of Report of Committee on Supply Train Operation. Moving Pictures of Supply Train on Southern Pacific	3.00 P. M. to 5.00 P. M.

ENTERTAINMENT

10.30 A. M.—Orchestral Concert, Entrance Hall, Million Dollar Pier.
3.30 P. M.—Orchestral Concert and Impromptu Dancing, Entrance Hall, Million Dollar Pier.
4.30 P. M.—Tea will be served in Entrance Hall.
9.30 P. M.—Grand Ball in Ball Room on Million Dollar Pier.

Wednesday, June 16, 1920

SECTION III—MECHANICAL

Discussion of Reports on:

Couplers and Draft Gear	9.30 A. M. to 9.50 A. M.
Car Wheels	9.50 A. M. to 10.20 A. M.
Car Construction	10.20 A. M. to 10.50 A. M.
Safety Appliances	10.50 A. M. to 10.55 A. M.
Loading Rules	10.55 A. M. to 11.20 A. M.
Train Brake and Signal Equipment.	11.20 A. M. to 11.50 A. M.
Train Lighting and Equipment	11.50 A. M. to 12.20 P. M.
Subjects	12.20 P. M. to 12.30 P. M.

SECTION VI—PURCHASES AND STORES

Consideration of Rules of Order	9.30 A. M. to 10.00 A. M.
Report of Nominating Committee	10.00 A. M. to 10.30 A. M.
Election of Officers, General Committee and Nominating Committee	10.30 A. M. to 11.00 A. M.

ENTERTAINMENT

10.30 A. M.—Orchestral Concert, Entrance Hall, Million Dollar Pier.

Railway Supply Manufacturers' Association

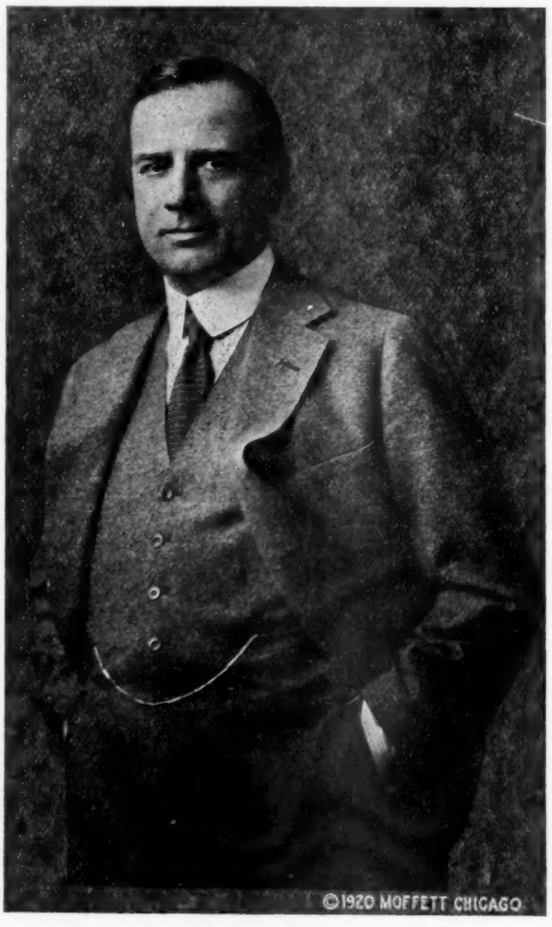
Exhibit Smashes All Records

THE BIGGEST PROBLEM which the Railway Supply Manufacturers' Association has had to overcome in preparing for the convention this year has been to try to take care of as many prospective exhibitors as possible. Every inch of space on the pier has been utilized, including the balcony in the main entrance hall. Even then a large number had to be turned away and many others have had to be satisfied with much less space than they desire. As last year, the entertainment program is modest and unpretentious. The committees in charge of the features which look to the comfort and convenience of the visitors have given even more than the usual amount of attention to make the big meeting run off smoothly.

The Railway Supply Manufacturers' Association plays such a large part in making the convention a success because of its

simple and strong organization and the fact that it has been developing over a period of years in building up to the elaborate affairs which are now being held.

The association during the past year has worked under the leadership of George R. Carr, president of the Association and vice-president of the Dearborn Chemical Company, Chicago. Mr. Carr has been one of the hardest and most efficient workers in the association for many years. His first committee work was done on the entertainment committee, on which he served for about six years. In 1915 he was chairman of this committee. In 1916 he was elected a member of the executive committee and in that year and in 1919 he served on the exhibit committee. (It will be recalled that no conventions were held in 1917 and no exhibit in 1918.) He was elected president of the Railway Supply Manufacturers' Association last year and besides being president he is chairman of the joint committee on arrangements on which the railway as well as the supply associations are represented. Mr. Carr entered upon his work of helping to make this year's convention a success with the enthusiasm and energy which characterize him in everything that he does. The increase in exhibit space from 93,000 to 100,000 ft. was largely due to his efforts, and it is chiefly due to him that the owners of the pier have given to the association all space between 75,000 and 93,000 ft. free of charge.



George R. Carr
President of the R. S. M. A.

Mr. Carr was born at Argenta, Ill., on January 23, 1877. He moved with his family to Chicago in 1893 and graduated from the Austin High School in 1897. Soon afterward he entered the University of Illinois, where he took a course in chemistry and graduated in June, 1901, with the degree of B. S. On July 1 of the same year he entered the employ of the Dearborn Chemical Company as a salesman. He held various positions in this company, and for the last 10 years has been vice-president and general manager.

The vice-president of the association is J. F. Schurch, vice-president of the T. H. Symington Company, Chicago. The secretary-treasurer is John D. Conway, of Pittsburgh.

These officers are supported by an executive committee of twelve members, several of whom are chairmen of important sub-committees. Three of the more important sub-committees—Entertainment, Enrollment and Transportation—are presided over by chairmen who are not members of the executive committee; the important duties and responsibilities of these men are such, however, that they are very strong factors in the successful promotion of the organization.

Executive Committee

The twelve members of the executive committee represent seven geographical districts as follows:

First district (New England states and Canada), one member: J. G. Platt, Hunt-Spiller Mfg. Corporation, Boston, Mass.

Second district (New York and New Jersey), three members: C. D. Eaton, American Car & Foundry Company, New York; Charles W. Beaver, Yale & Towne Mfg. Company, New York, and H. G. Thompson, Transportation Engineering Corporation, New York.

Third district (Pennsylvania), two members: W. H. S. Bateman, The Champion Rivet Company, Philadelphia, Pa. (Mr. Bateman also represents the Parkesburg Iron Company), and John M. Gillespie, Lockhart Iron & Steel Company, Pittsburgh, Pa.

Fourth district (Ohio, Indiana and Michigan), two members; C. D. Jenks, The Damascus Brake Beam Company, Cleveland, Ohio, and George A. Cooper, Frost Railway Supply Company, Detroit, Mich.

Fifth district (Illinois), two members: E. H. Bankard, Jr., Globe Seamless Steel Tubes Company, Chicago, Ill., and L. S. Wright, National Malleable Castings Company, Chicago, Ill.

Sixth district (Delaware, Maryland, District of Columbia, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Kentucky and Tennessee), one member: George L. Morton, Galena-Signal Oil Company, Atlanta, Ga.

Seventh district (states west of the Mississippi river, including Louisiana, Minnesota and Wisconsin), one member: C. P. Cass, Westinghouse Air Brake Company, St. Louis, Mo.

The members of the executive committee who were elected at the 1919 convention were Messrs. Bateman and Gillespie of the Third district; Mr. Jenks of the Fourth district to fill out the unexpired term of J. F. Schurch, who moved from the district; Mr. Wright of the Fifth district, and Mr. Morton of the Sixth district. In the Fifth district Mr. Bankard, Jr., was appointed by the executive committee to serve one year to fill out the term of Mr. Carr who was elected to the presidency of the association.

Five new members will be elected this year to succeed Messrs. Platt of the First district, Eaton of the Second district, Jenks of the Fourth district, Bankard of the Fifth district, and Cass of the Seventh district, all of whose terms expire.

Exhibit Committee

Formerly the exhibit committee consisted of three members, but this year it was increased to five, all of whom are members of the executive committee. J. G. Platt is chairman, and the other members are C. W. Beaver, E. H. Bankard, Jr., J. M. Gillespie and H. G. Thompson. Photographs of the members of the exhibit

committee will be found at the head of the article in this issue describing the exhibit.

Enrollment Committee

This committee has the arduous task of enrolling all members for both the railway and the supply associations and is made up as follows:

C. H. Gayetty, Chairman, Quaker City Rubber Co., Philadelphia, Pa.
Geo. A. Barden, Duntley-Pneumatic Tool Co., Philadelphia, Pa.
Jos. E. Brown, O'Malley-Beare Valve Co., Chicago, Ill.
C. L. Bates, Railway Review, Chicago, Ill.
S. H. Campbell, Western Railway Equipment Co., St. Louis, Mo.
Geo. W. Denyven, Parkesburg Iron Co., Boston, Mass.
F. E. Dodson, U. S. Rubber Co., Baltimore, Md.
Harry Jacques, Simmons Hardware Co., Philadelphia, Pa.
F. C. Koch, Railway Age, New York, N. Y.
S. Inglis Leslie, The Leslie Co., Lyndhurst, N. J.
L. D. Mitchell, Detroit Graphite Co., Chicago, Ill.
F. V. McGinness, Transportation Engineering Co., New York, N. Y.
J. A. Stevens, Devoe & Raynolds Co., Inc., New York, N. Y.
F. H. Smith, Gold Car Heating & Lighting Co., New York, N. Y.
H. K. Williams, Safety Car Heating & Lighting Co., Washington, D. C.

Entertainment Committee

This committee, which has charge of all entertainment features, is made up as follows:

William K. Krepps, Chairman, Crucible Steel Co. of America, New York.
Charles L. Brown, Manning, Maxwell & Moore, Chicago, Ill.
L. O. Cameron, Pressed Steel Car Co., Washington, D. C.
Floyd Coffin, Franklin Railway Supply Co., New York, N. Y.
Dan Eubanks, Galena Signal Oil Co., Cincinnati, Ohio.
J. W. Fogg, Boss Nut Company, Chicago, Ill.
J. R. Forney, Ralston Steel Car Co., Washington, D. C.
W. E. Greenwood, The Texas Company, New York, N. Y.
Horace Hager, American Car & Foundry Co., New York, N. Y.
Ellsworth Haring, New York, N. Y.
Oscar B. Hayward, care of Williams-Hayward Co., Chicago, Ill.
R. J. Himmelright, American Arch Co., New York, N. Y.
T. J. Hudson, Jr., Chicago Pneumatic Tool Co., New York, N. Y.
Langley Ingraham, Lowe Brothers Co., Dayton, Ohio.
William W. Melcher, Massachusetts Mohair Plush Co., Boston, Mass.
John D. McClintock, William Sellers & Co., Philadelphia, Pa.
I. C. Rogers, W. R. Keene & Co., New York, N. Y.
S. W. Sargent, American Steel Foundries, Philadelphia, Pa.
L. B Sherman, Railway Age, Chicago, Illl
Gardner Taylor, care of The J. T. Jones Lumber Co. ,New York, N. Y.
R. P. Townsend, Liberty Steel Products Co., New York, N. Y.
H. A. Varney, Sunbeam Electric Mfg. Co., Chicago, Ill.
W. M. Wilson, Flannery Bolt Co., Chicago, Ill.
W. B. Wise, U. S. Rubber Co., New York, N. Y.

Transportation Committee

The most important function of the Transportation Committee is to look after the handling of the rolling chairs; it also supervises the automobile service and other local transportation features during the conventions. It is made up as follows:

John C. Kuhns, Chairman Burden Iron Co., Chicago, Ill.
Al. McNeill, Central Electric Co., Chicago, Ill.
Roswell P. Cooley, Vapor Car Heating Co., New York.
Walter C. Doerring, Southern Wheel Co., St. Louis, Mo.
T. J. Powell, Galena Signal Oil Co., St. Louis, Mo.
G. R. Berger, Gould Storage Battery Co., Depew, N. Y.
Gilbert E. Ryder, Locomotive Superheater Co., New York, N. Y.
John L. Phillips, The Okonite Co., Passaic, N. J.
W. Jerry King, Hewitt Rubber Co., Chicago, Ill.
S. C. Dinsmore, National Refining Co., Chicago, Ill.
H. A. Glenn, The Edna Brass Mfg. Co., Chicago, Ill.
J. B. Jordan, Crane Company, Chicago, Ill.
Harry Niel, Midvale Steel Co., Philadelphia, Pa.
J. A. McFarland, The Bird Archer Co., St. Louis, Mo.
Bruce P. Owens, Maginnis Company, Chicago, Ill.
Edwin L. Georger, Pratt & Lambert, Buffalo, N. Y.
H. E. Daniels, West Disinfecting Co., Chicago, Ill.
Charles D. Derby, Joyce-Cridland Co., Dayton, Ohio.
F. A. Elmquist, Sherwin-Williams Co., New York, N. Y.
R. R. Porterfield, Locomotive Supply Co., Chicago Ill.
J. W. Trent, H. W. Johns-Manville Co., St. Louis, Mo.
W. Leighton, Oxweld R. R. Service Co, Chicago, Ill.
F. M. Condit, Fairbanks, Morse & Co., Chicago, Ill.
Geo. W. Ristine, Jr., Whiting Fdry. Equipment Co., Harvey, I.ll
Jack Ross, Westinghouse Elec & Mfg. Co., E. Pittsburgh, Pa.
C. P. Wright, Amer. Brake Shoe & Fdry. Co., Chicago, Ill.
F. Coolidge, Buckeye Steel Castings Co., Chicago, Ill.

Other Committees

The finance committee includes George A. Cooper as chairman, C. P. Cass and George L. Morton.

The badge committee consists of L. S. Wright, chairman, C. D. Eaton and George L. Morton.

The by-laws committee consists of W. H. S. Bateman, chairman, H. G. Thompson and George L. Morton.

The hotel committee consists of C. D. Jenks, chairman, C. D. Eaton and George L. Morton.

Telephones

A SWITCHBOARD with the necessary operators has been placed on the pier in connection with several long-distance booths, which are conveniently located in different sections of the pier.

Railway Club Secretaries

MEMBERS of the Society of Railway Club Secretaries will, as usual, come to Atlantic City for the annual meeting of the Society to be held at 10 o'clock Friday morning in room 192 of the Blenheim. It will be preceded on Thursday, at 1 P. M., by a round-table luncheon of the secretaries and a limited number of invited guests.

Post Office

UNITED STATES MAIL addressed in the care of the Secretary's Office, Million Dollar Pier, Atlantic City, N. J., will be taken care of and distributed to exhibitors' booths.

Members are requested not to send general circular matter for distribution to other exhibitors, as this is a violation of the association rules.

Registration

THE ENROLLMENT BOOTH at the entrance to the pier will be operated during the convention in accordance with the following schedule:

		Morning	*Afternoon*	*Evening*
Wednesday,	June 9	9 to 1	2 to 6	7 to 8
Thursday,	June 10	9 to 1	2 to 6	7 to 8
Friday,	June 11	9 to 1	2 to 6	7 to 8
Saturday,	June 12	9 to 12	2 to 4	8 to 9
Sunday,	June 13	10 to 12	2 to 4	
Monday,	June 14	9 to 1	2 to 6	8 to 9
Tuesday,	June 15	9 to 12	2 to 5	
Wednesday,	June 16	9 to 11		

Rolling Chairs

THE TRANSPORTATION COMMITTEE will provide rolling chairs for members and guests of the convention wearing official badges, from the following stations, between the hours indicated, from June 9 to June 16, inclusive:

	A. M.	P. M.
The Pier	9.00 to	6.30
Marlborough-Blenheim	9.00 to	6.00
Traymore	9.00 to	6.00
Chalfonte Hotel	9.00 to	6.00
Chelsea Hotel	9.00 to	6.00
Alamac Hotel	9.00 to	6.00
St. Charles Hotel	9.00 to	6.00
The Breakers	9.00 to	6.00
Ambassador Hotel	9.00 to	6.00
	P. M.	P. M.
To all Entertainments on Pier	8.30 to	10.00

Unoccupied chairs may be stopped at any point on the Boardwalk, except between the Marlborough-Blenheim and the Pier, and they may be used in either direction.

Convention chairs are not allowed to wait more than fifteen minutes. The Transportation Committee will consider it a favor if members or guests of the Associations will report to the committee any inattention on the part of an attendant. If the number on the chair is given, it will facilitate checking the complaint.

The Man Who Saw

There's No Place Like Home

Father Time has advanced the hands on the daylight-saving clock a whole year since The Man Who Saw joined the throng of believers in American railroads at their annual manifestation of confidence. He enjoyed himself in the humble capacity of an interested observer at the convention of 1919 and returns more interested than ever in the growth of the exhibit of 1920. And in the meantime he has been given an excellent opportunity to cultivate his ability—or the lack of it—to see better. He saw a lot in the lands of our neighbor, the South American. From Cuba, south to Panama and Ecuador and on through Peru, Bolivia and Chile, he wondered at and admired the ways of railroaders in their contentions with conditions more varied than our own.

He traveled on the roof of the world and marveled at the nerve of the men who promoted the building of the iron trail, and the determination of those who defied hardships in the construction of a line across the Andes from Chile to Argentina—a topography that seems to challenge the agility of a Rocky Mountain goat. Safely over to the other side, his breath was literally taken away by the magnificence of South America's modern metropolis, the city of Buenos Aires, so full of lessons for the hurried American. Of the railways in that country, he carried away an impression that can be described as excellent, both as to administration, equipment and facilities.

On to Brazil, he learned the lesson of distinction of nationalities and the fine line which, apparently unseen, exists nevertheless and defines success or failure for those of us who would cultivate the business relationship of the wide awake and independent Brazilians. In the city of Rio de Janeiro he imagined himself in a tropical garden—for such it is. He did not see any monkeys hanging from the branches of the beautiful palm trees or on the foot of his bed and there were no snakes basking in the sun on the stately Avenida Rio Branco, the Fifth avenue of Rio, albeit, Mr. Volstead is unknown in those parts and "tanglefoot" in an endless variety, flows as freely there as the water in our own pleasant little fountain near the fish tank on the pier. Instead, he saw the hand of every Brazilian in its effort to make the architectural attractiveness of the town match the natural beauty of its mountainous surroundings and he testifies that they did a good job!

The man saw and sometimes he looked twice, and in seeing, he tried to pack away the answers to thousands of questions he felt sure he would be asked on his return. Here he learned the limit of human absorption—and he brought back what he could.

He likewise learned the significance and charm of the homely old phrase—"be it ever so Bolshevik, there's no place like home" and he is glad to be back to oatmeal and cream, 30 cent sugar, the elections of a President, shortage of cars and "strikes, fires and accidents beyond our control."

Heads, We Export; Tails, We Don't

The full South American slant on American exporting is a long-winded tale, too long for the column of The Man Who Saw. But it was rubbed into him in his travels that some of our would-be-exporters to Latin America would do well to concentrate on a constructive policy—or else give up the idea. He is led to believe that the old day of hectic excitement to dump the surplus on these fellows, has passed. They like us; some of them admire us, and in certain fields the latch key hangs on the outside and there's a welcome on the mat.

Why not extend co-operation and improve the service and relations before they take the key away and turn the mat over? This is going to happen if we don't "watch our step."

A Few More Hugs for 10c

The railway patron in the Argentine can get a few more hugs, in addition to those he already got at the train gate, by the simple expenditure of a dime. This valuable little coin, deposited in the slot of a platform ticket machine mounted on the train gates of Buenos Aires stations issues a "platform ticket" which passes one to the train where he can hang on her neck at the open window until the speed of the departing "Rapido" makes continuance impossible. The machines pay, and pay well. They pay the traveller a full 10 cents worth, for all of Latin America loves the absolute final "despedida"—the tenderest of all good-bye's. They pay the railway company in an accumulation of dimes which is said to average $30 for every long distance train out of the city—and there are a score of such trains every day in the year.

American Railroad Names

The Colombian gentleman from Manizales is here to learn our ways and among the many questions he asks his friend, The Man Who Saw, is, "Of what importance are the names of some of our railroads to the territory they serve?" He wonders why the transcontinental Atchison, Topeka & Santa Fe doesn't proclaim it for the edification of those in his country who would be led to believe that the line only connected the three towns named. He likewise enquires the significance of "Missouri Pacific," and why—and others. To which The Man Who Saw replied with the ancient wheeze of the old native who, living twenty miles from the newly built right-of-way of the International & Great Northern spelled with difficulty the letters I.-N. G. N. on the tender of the newly arrived, red wheeled 4-4-0 with its "diamond" stack, and commented dryly "INGN—that's a hell of a way to spell engine!"

Welcome, Britain, To Our Midst

There has hardly occurred a more significant turn in the variable tides of trade than in this year's appearance on our pier of an assortment of machine tools from "the other side"—unless it has been the recent invasion, by our own machine tool builders, of that same territory. It's a signal to reciprocity and a challenge to our builders to remember the famous epithet: "If a man builds a better moustrap than his neighbor, though his house is built in the wilderness, the world will make a beaten path to his door." The sentiments of the friends of the Man Who Saw seem to spell a friendly welcome to our British cousins—an American welcome with a punch, a "fair field and no favors." Show us, Britain, we're from Missouri!

Exhibit Committee, J. M. Gillespie, Missing

Big Exhibit Occupies More Than 100,000 Square Feet

Many Companies Were Unable to Secure Booths; Balcony of Main Hall Utilized to Good Advantage

THOSE who exhibited at the 1919 convention were very greatly impressed with the increased number of railroad men in attendance at the convention and the thorough way in which the larger number of them studied the exhibits. It will be recalled that the Railroad Administration asked that the mechanical department officers of each road make a report as to those things which they saw or heard at Atlantic City which could be utilized to practical advantage on their own roads. The Railway Supply Manufacturers' Association wisely published a booklet containing the names of the exhibitors, with blank spaces on which to make notes as to important features in each exhibit. These books were used to splendid advantage, and as a result the association has gotten out a similar booklet this year, feeling that many of the delegates will want to make notes and continue the practice which was so well started last year.

Undoubtedly the experience of exhibitors last year is responsible for the fact that the demands for space this year far exceeded the capacity of the pier, and that it was not possible to anywhere near accommodate the large number of companies that made application for space. When the convention opened this morning there were 359 exhibitors, with over 100,000 sq. ft. of exhibit space. The increase of almost 7,000 sq. ft. over last year was made possible by utilizing the balcony surrounding the ballroom. To do this it was necessary to remove the last two rows of seats and otherwise remodel the balcony; this resulted in an addition of 63 exhibit spaces, averaging 9 by 11 ft., and making a total of 6,706 sq. ft. In order that there may be no possibility of visitors overlooking these exhibits, arrangements have been made to display the names of the companies prominently on the front of the balcony facing the ballroom.

Many of the exhibitors had great difficulty in getting their material to Atlantic City because of the railroad strike and the freight congestion. Too great credit cannot be given to the railroads for the splendid way in which they co-operated in expediting freight and express shipments containing exhibit material. The Pennsylvania Railroad in particular co-operated very closely with the Railway Supply Manufacturers' Association in this respect.

The table shows the remarkable rate at which the exhibit has grown in recent years. Those who predicted that the closing of the exhibit during the war years would seriously affect its future have been very badly mistaken; it seems rather to have added a renewed impetus to the growth of the big exhibition.

HOW THE EXHIBITS HAVE GROWN

Year	Exhibit space sq.ft.*	Number of exhibits
1910	71,019	...
1911	76,110	245
1912	83,507	262
1913	87,360	277
1914	82,218	266
1915	70,412	222
1916	76,643	258
1917 and 1918†	no exhibit	
1919	93,499	314
1920	100,061	359**

*Square feet of space actually paid for. Does not include free space to M. C. B. Committee.
**Number of exhibitors on Wednesday morning, June 9th.
†No exhibit because of war.

A complete list of the exhibitors, together with details of their exhibits and a list of their representatives follows:

List of Exhibitors

A. B. C. Transit Refrigeration Company, Chicago, Ill.—One model car equipped with A. B. C. system of refrigeration and heating, and one 40 ft. railroad car fully equipped with A. B. C. system of refrigeration and heating on exhibition track. Represented by Lewis Penwell, H. R. Newlean and O. E. Shaw. Space 759.

Aga Railway Light & Signal Company, Elizabeth, N. J.—Oxy-acetylene cutting and welding torch. Represented by J. K. Howard and A. G. Straetz. Space 801.

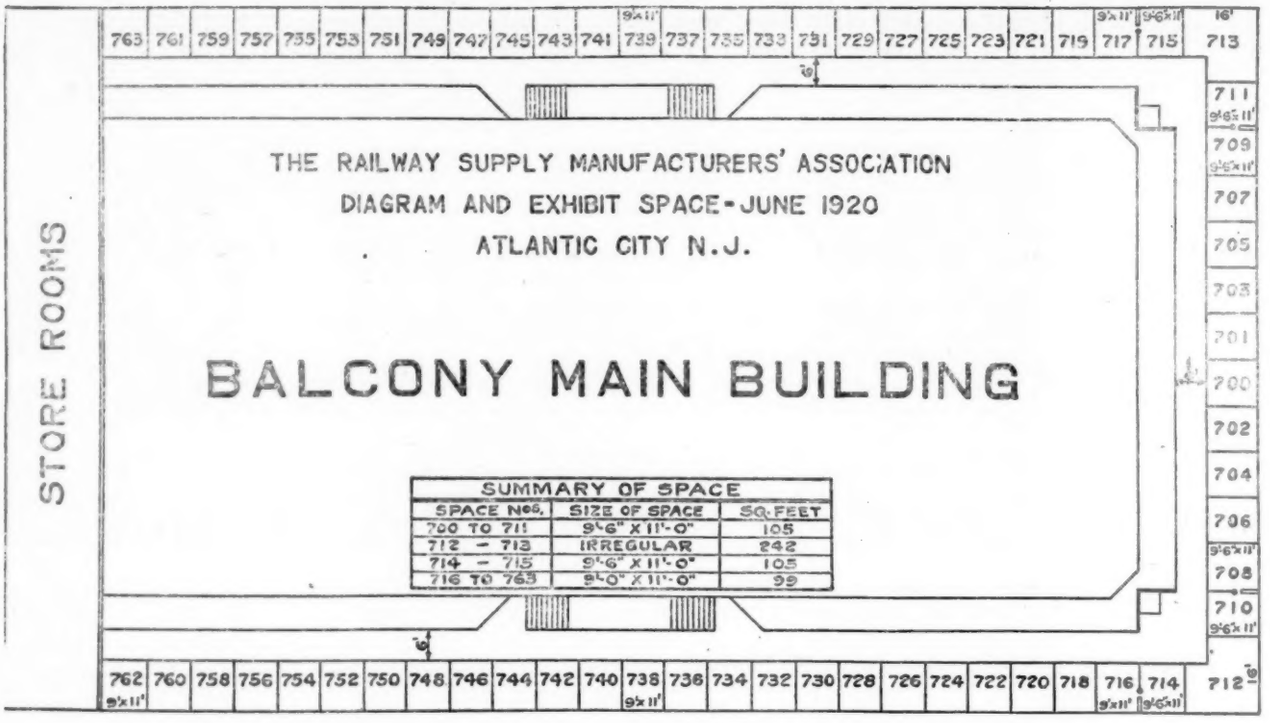

THE RAILWAY SUPPLY MANUFACTURERS' ASSOCIATION
DIAGRAM AND EXHIBIT SPACE - JUNE 1920
ATLANTIC CITY N.J.
BALCONY MAIN BUILDING
STORE ROOMS
BOARDWALK
SUMMARY OF SPACE
SPACE NOS. | SIZE OF SPACE | SQ. FEET
700 TO 711 | 9'-6" X 11'-0" | 105
712 - 713 | IRREGULAR | 242
714 - 715 | 9'-6" X 11'-0" | 105
716 TO 763 | 9'-0" X 11'-0" | 99

Exhibit Spaces on the Balcony of the Main Building—A New Feature This Year

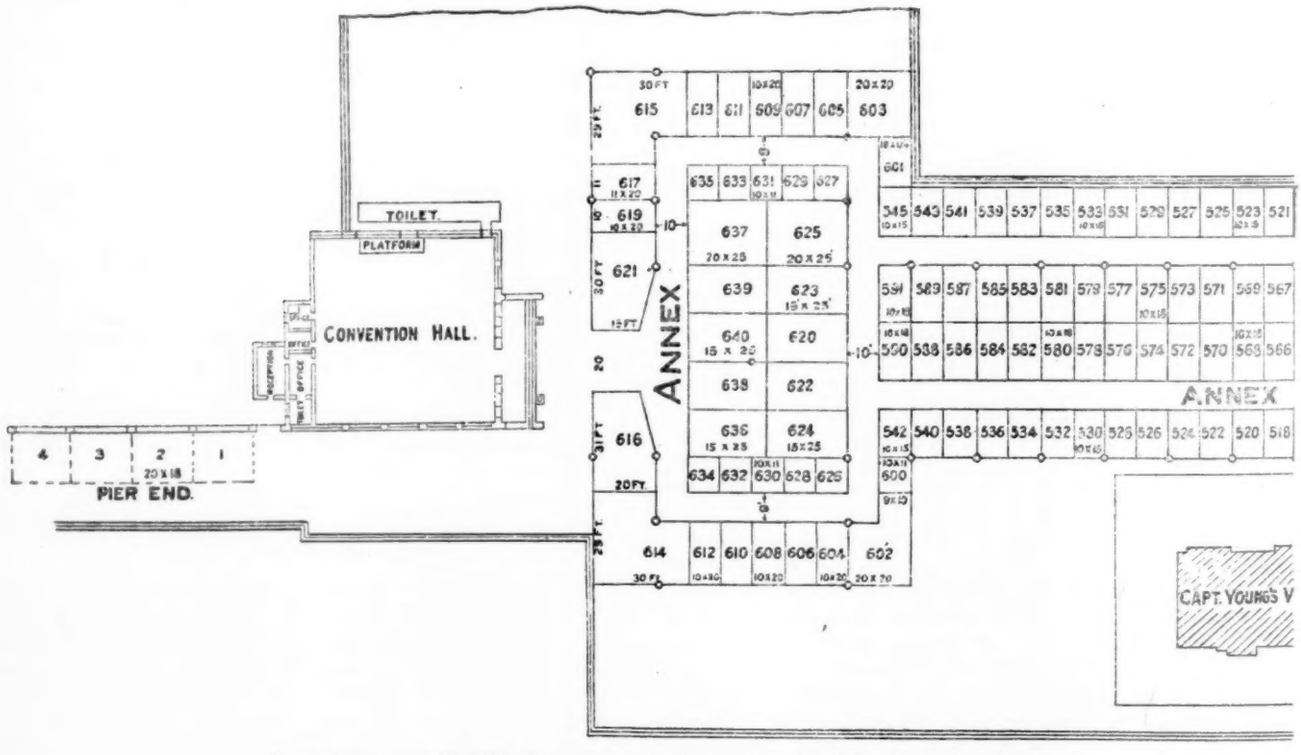
Air Reduction Sales Company, New York, N. Y.—Airco "A" welding torches; "C" lead burning torch; "D" cutting torch, and Airco oxygen and acetylene cylinders. Represented by E. L. Mills, R. T. Peabody, H. F. Weldin, G. H. Crofton, A. S. Kinsey, J. A. Warfel, A. W. Brown, G. W. Irwin, W. P. Roberts, H. H. Melville and D. C. Sinclair. Spaces B and C on the porch.

Ajax Manufacturing Company, The, Cleveland, Ohio.—One 2-inch upsetting forging machine and various forgings. Represented by W. W. Criley, R. W. Bannerman, J. A. Murray and A. L. Guilford. Spaces 120-122-124.

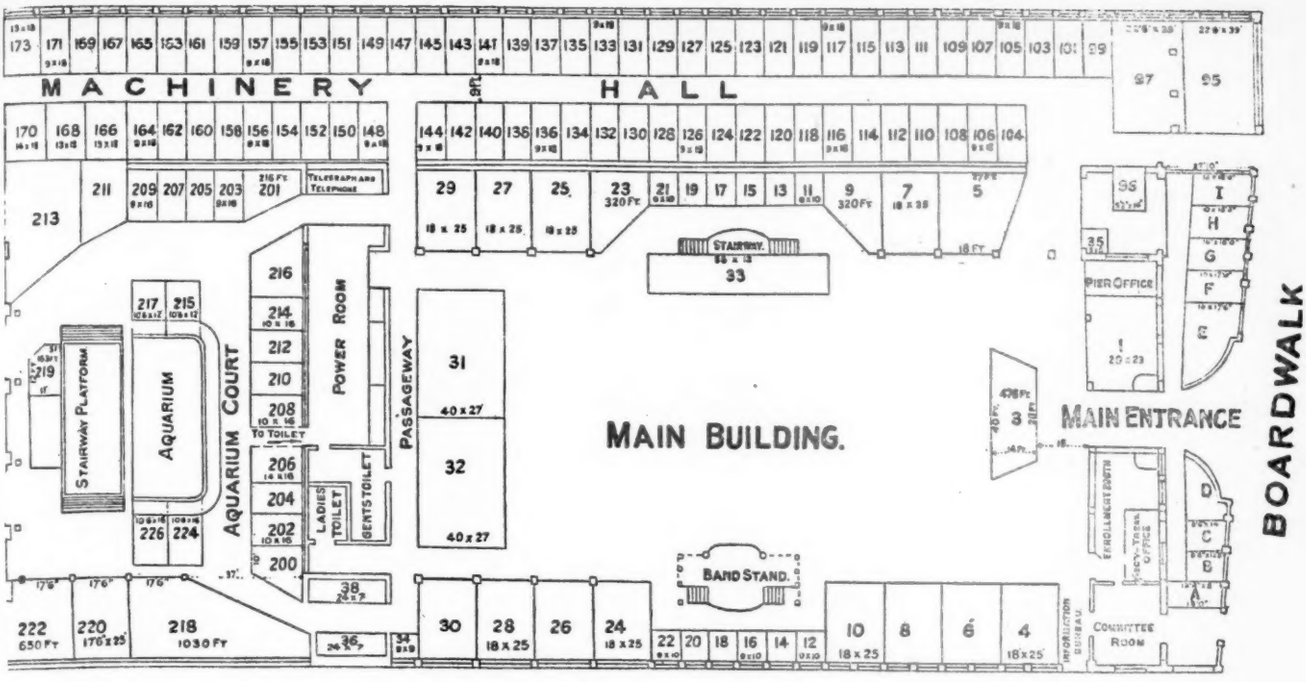
Ajax Metal Company, The, Philadelphia, Pa.—Car journal bearings; locomotive brasses; Ajax process ingots, brass and bronze; Ajax ball bearing alloy. Represented by W. J. Coane, A. MacDougall, S. E. McClure, J. C. Brightbill and G. S. K. Wheeler. Space 749.

Allegheny Steel Company, Brackenridge, Pa.—Asco pressed steel journal box lids; truck spring plates; steel ties, and other pressed steel railway specialties. Represented by L. W. Hostettler. Space 755.

American Abrasive Metals Company, New York, N. Y.—Feralun



Arrangement of Exhibit Spaces at the Convention Hall End of the Pier.



Arrangement of the Exhibit Spaces at the Boardwalk End of the Pier

anti-slip safety treads; door thresholds; anti-slip ladder feet; brake shoes; rabble blades; structural car steps; vuicalun and bronzalun safety treads. Represented by Ellsworth Burger and Ralph C. Davison. Space 626.

American Arch Company, Inc., New York, N. Y.—Locomotive arch brick. Represented by J. S. Coffin, Samuel G. Allen, LeGrand Parish, J. P. Neff, W. L. Allison, R. J. Himmelright, J. T. Anthony, H. B. Slaybaugh, G. A. Price, G. M. Bean, W. W. Neale, T. F. Kilcoyne, E. T. Mulcahy, T. M. Ferguson, M. R. Smith, H. Darby, J. D. Brandon, E. H. Cook, A. W. Clokey, Thos. Mahar and George Wagstaff. Spaces 414-416-422-424.

American Automatic Connector Company, The, Cleveland, Ohio.—American automatic connector for coupling air and steam hose between railroad cars. Represented by M. A. Barber, F. R. Bolles, Frank F. Walker, Frank T. Hyndman and N. M. Barker. Spaces 362-363-364-365.

American Brake Company, St. Louis, Mo.—Reception booth. Represented by R. E. Adreon. Spaces 29-29.

American Brake Shoe & Foundry Company, New York, N. Y.—Standard patterns railway brake shoes; steel back driver shoes; steel back engine truck shoes; steel back pas-

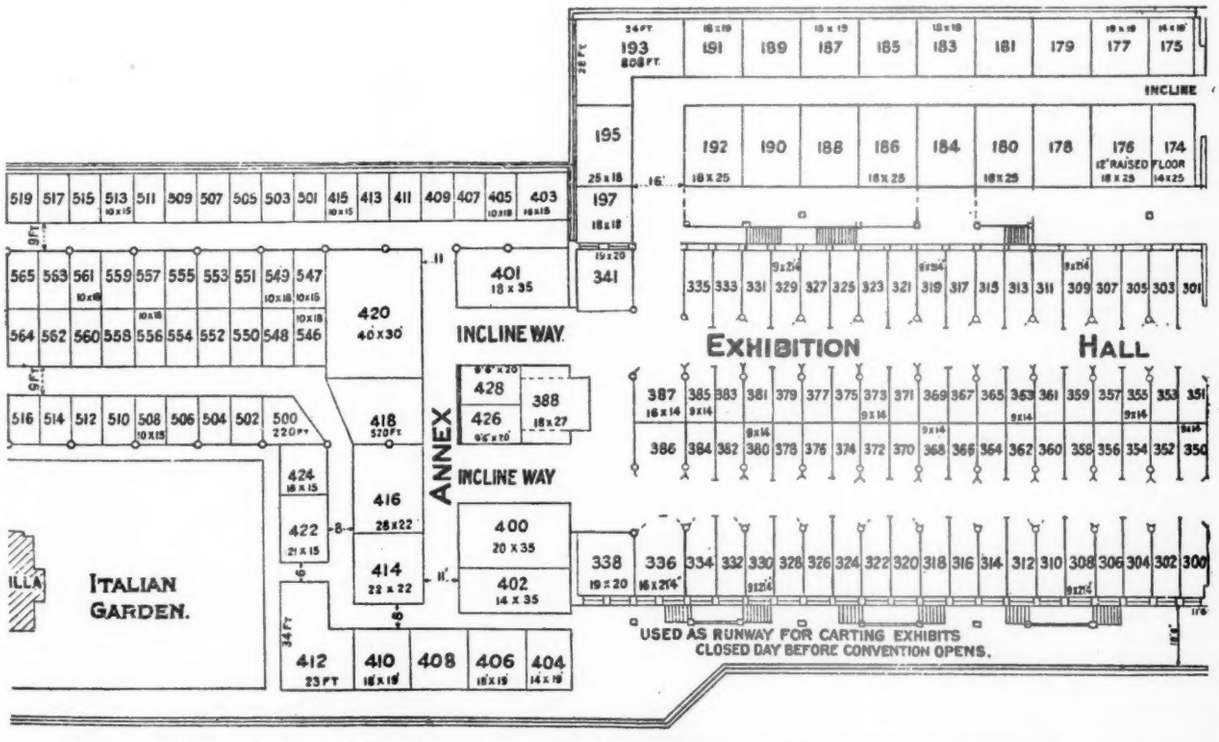


Exhibit Spaces in Part of the Annex, Exhibition Hall and Machinery Hall Extension

senger and tender shoes; steel back freight car shoes; malleable iron locomotive driver brake head and keys. Represented by F. W. Sargent, W. S. McGowan, Thos. Finigan, L. R. Dewey, C. P. Wright, W. B. Given, Jr., E. L. Janes, A. H. Elliot, F. H. Coolidge, R. E. Holt, M. N. Trainer, T. S. L. Seaman, E. B. Smith and F. P. Biggs. Space 418.

American Car & Foundry Company, New York, N. Y.—Two Berwick electric rivet heaters; two tank cars on the exhibition track. Represented by W. H. Woodin, Wm. M. Hager, G. W. Cornell, Horace Hager, Scott H. Blewett, C. S. Gawthrop, M. Buick, N. A. Doyle, W. F. Kingston, C. D. Eaton, J. H. Weisbrod, R. H. Davenport, M. C. Shands, S. W. Tuttle, W. A. Williams, H. C. Wick, C. A. Smith, L. T. Carroll, S. S. DeLano, S. A. Mallette, F. G. Wolff, H. C. Lunger, J. J. McBride, E. D. Campbell, Norman Litchfield, W. E. Hedgcock, M. J. Crispin, G. R. Scanland, E. S. Block, L. E. Hess, W. J. Harris, M. H. Connelly, O. H. Mellum, J. L. Onderdonk, A. Speirs, C. D. Terrell, F. H. B. Fowler, W. C. Dickerman, F. A. Stevenson, B. Wilson, D. M. Knox, J. M. Keller, T. A. Dooley, W. H. Sanford, John Ensign, L. M. Roe, Frank Faust, D. J. Whalen, F. H. Gibbs, A. E. Ostrander, F. C. Cheston, J. W. Sheffer, James S. Helt, A. G. Wood and W. M. Earle. Spaces 3 and 175

American Chain Company, Inc., Bridgeport, Conn.—Various chains for use in railroad service. Represented by W. M. Taussig, A. P. Van Schaick and G. C. Isbester. Space 307.

American Flexible Bolt Company, Pittsburgh, Pa.—Type "A" American staybolts for locomotive boilers; type "LW" American reduced body staybolts—water space stays; type "LR" radial staybolts; type "LC" taper thread crown radials. Miscellaneous reduced body staybolts, hollow and with telltale holes drilled, for marine boilers, oil still boilers. Represented by C. A. Seley, H. T. Frauenheim. Also representatives of Benson & Co., sales agents for American Flexible Bolt Co.; R. W. Benson, L. W. Widmeier, J. A. Trainor, H. G. Doran, M. M. McCallister and W. F. Heacock. Space 543.

American Locomotive Company, New York, N. Y.—Alco reverse gear; flexible staybolts; intercepting valves. Represented by A. Fletcher, L. Best, J. Davis, D. W. Fraser, C. K. Lassiter, J. B. Ennis, W. P. Steele, C. M. Muchnic, G. R. Margarvey, W. F. Weller, G. Weller, F. J. Cole, C. J. Mellin, J. Partington, G. P. Robinson, G. G. Jones, Geo. Gurry, O. P. Parsons, Ross Anderson, H. Long, H. J. Downes, A. W. Bruce, C. H. Apps, C. Markel, S. Miller, J. Kindevater, L. S. Carroll, W. K. Farrell, J. R. Foulder, G. R. Ashworth, H. Baxter and C. W. Todd. Space 623.

American Malleable Castings Association, Cleveland, Ohio.—Display of various kinds of malleable iron castings showing uses and quality of material, specifications. Represented by Frank J. Lanahan. Spaces 153-155-157.

American Mason Safety Tread Company, Boston, Mass.—Mason safety treads; Stanwood car steps; Karbolith car flooring. Represented by Edw. F. Kuemmerle. Space 542.

American Metal Product Company, Brooklyn, N. Y.—Electrical specialties for locomotive equipment. Represented by N. A. Levitan. Space 800.

American Rolling Mill Company, The, Middletown, Ohio.—Examples of durable old iron; American ingot iron sheets for locomotive and car construction; polished sheets for locomotive jackets; alloy coated sheets for coach and cab roofs; galvanized sheets for freight car roofs and general building purposes; special finished sheets for painted locomotive jackets; section taken from American ingot iron and steel ingots showing the gas content of each as indicated by blow holes; railroad sign made of American ingot iron; illuminated transparencies showing steel plant and rolling mill views and interesting installations of American ingot iron. Represented by T. W. Jenkins, J. S. Roney, W. S. Stephenson and C. M. Spear. Spaces 588-589.

American Steam Gauge & Valve Manufacturing Company, Boston, Mass.—Locomotive gauges and valves; hydraulagraph; trainagraph, and standard type dead weight gauge tester. Represented by C. A. Allen, H. B. Nickerson and P. H. Ryan. Space 358.

American Steel Foundries, Chicago, Ill.—Economy cast steel draft arm; Davis steel wheel; Ajax and Hercules brake beams; Simplex coupler; cast steel bolster; Simplex clasp brake; Simplex coupler pocket; Vulcan truck. Represented by R. P. Lamont, G. E. Scott, J. W. Dalman, D. T. Harris, G. F. Slaughter, J. V. Bell, W. J. Lynch, G. H. Hopkirk, Theo. Cook and P. A Martin. Space 193.

American Tool Works Company, The, Cincinnati, Ohio.—Lathes; radials; drills; shapers. Represented by J. C. Hussey, H. W. Schatz and L. W. S. Alter. Spaces 105-113.

Anchor Packing Company, The, Philadelphia, Pa.—Air pump and throttle packing; mechanical rubber goods. Represented by W. R. Haggart, J. P. Landreth, D. J. P. Murray and Wallace Robb. Spaces 367-369.

Ashton Valve Company, The, Boston, Mass.—Safety valves and gages for locomotive and stationary boilers; single, duplex, triplex and quadruplex air gages; dead weight gage testers and standard test gages; three speed air brake and wheel press recording gages; portable boiler test pumps. Represented by A. C. Ashton, H. O. Fettinger, J. F. Gettrust and J. W. Motherwell. Space 518.

Association of Manufacturers of Chilled car Wheels, Chicago, Ill.—One 33 in. No. 625 M. C. B. car wheel for 30-ton cars; one 33 in. No. 700 M. C. B. car wheel for 40-ton cars; one 33 in. No. 725 M. C. B. car wheel for 50-ton cars; one 33 in. No. 850 M. C. B. car wheel for 70-ton cars. Also a moving picture showing the various processes of manufacturing the chilled iron car wheel, including the moulding, pouring, pitting and drop testing of the wheel. In addition thereto are a series of pictures showing the measurement of temperature stresses to which the wheels are subjected, indicated by test gages. These pictures were secured through the courtesy of the officials of the Pennsylvania Railrod. Represented by Geo. W. Lyndon, F. K. Vial and A. D. Whipple. Space 402.

Aterite Company, Inc., New York, N. Y.—Aterite, a high temperature, high pressure, acid and alkali resisting alloy, in castings, rolled rods and sheets, tubes, wire and stampings. Represented by Ernest G. Jarvis. Spaces 719-721.

Atlantic Hand Brake Corporation, Buffalo, N. Y.—Worm gear hand brakes; combination hand and electric power brake. Represented by J. H. Weidenmiller and Chas. E. B. Smith. Space 752.

Baird Pneumatic Tool Company, Kansas City, Mo.—Yoke type riveter; staybolt cutter; pinch bug riveter; pipe bender; furnace and working model of flue rattler. Represented by F. M. Wright, Charles F. Lukins, Archie M. Baird and C. E. Dillon. Spaces 371-373.

Baker R. & L. Company, The, Cleveland, Ohio.—Industrial trucks and tractors. Represented by Nathaniel Platt, M. A. Watterson, Wm. P. Kennedy and H. C. Sherer. Spaces H and I.

Baldwin Locomotive Works, The, Philadelphia, Pa.—Reception booth. Represented by G. Greenough, A. H. Ehle, L. W. Metzger, C. Riddell, R. Sanderson, G. F. Jones, A. S. Goble, P. G. Cheatham, E. C. Peirce, K. Andrew, H. F. Binder, R. M. Campbell, C. W. Frech, E. B. Halsey, S. McNaughton, Jr., B. N. Reiley, R. J. Simmington and F. Woollven. Spaces 723-725.

Barco Manufacturing Company, Chicago, Ill.—Flexible joints and connections; automatic smoke box blower fittings; crossheads and shoes; power reverse gears. Represented by F. N. Bard, C. L. Mellor, A S. Lewis, F. H. Stiles and F. S. Wilcoxen. Space 639.

Barrett Company, The, New York, N. Y.—Carbosota, coaltar, pitch and felt products; roofing; waterproofing; wood preservatives; metal protective paints. Represented by William S. Babcock and C. T. Bilyea. Spaces 700-702.

Bastian-Blessing Company, The, Chicago, Ill.—Oxy-acetylene welding and cutting apparatus. Represented by F. R. Goehler and F. E. Seiler, Jr. Space 715.

Beaudry and Company, Inc., Boston, Mass.—Quarter size working model, complete in detail, of Beaudry champion power hammer motor driven. Represented by Otto Abrahamsen and A. Parsons. Space 209.

Besly & Company, Charles H., Chicago, Ill.—Besly patternmaker's grinder; Besly taps. Represented by Edward P. Welles, C. A. Knill and John Curns. Spaces 152-154.

Bettendorf Company, The, Bettendorf, Iowa.—Section of Bettendorf steel underframe; comparison of U. S. R. A. and Bettendorf trucks; one complete Bettendorf standard truck; one Bettendorf swing motion truck for caboose and stock cars. Represented by J. W. Bettendorf, J. H. Bendixen, C. J. W. Clasen and K. M. Hamilton. Space 218.

Betts Machine Company, Rochester, N. Y.—Photographs of journal truing lathes, boring mills, slotters, horizontal boring and drilling machines, 26-inch swing and larger engine lathes. Represented by Alfred Trosch, A. H. Ingle, A. W. Van Buren, F. H. Severin and H. M. Bowman. Space 114.

Bird-Archer Company, The, New York, N. Y.—Polarized boiler chemicals; anti-foaming and anti-leak chemicals; Harter Circulator plate; "Baco" core oils, core compounds, brass cleaner, furnace cement, blow-off valves and high-speed cast steel tools. Represented by P. B. Bird, C. A. Bird, L. F. Wilson, J. A. McFarland, W. E. Ridenour, T. A. Peacock, D. T. Main, W. W. Burden, H. E. Wheeler, John Barnes and C. M. Goldman. Space 31.

Black & Decker Manufacturing Company, The, Baltimore, Md.—Portable electric drills, electric valve grinders and electric air compressors. Represented by G. R. Lundane, G. A. Dodge, M. E. Lilley and W. C. Allen. Space 206.

Blackall, Robert H. Pittsburg, Pa.—Blackall ratchet brake lever; improved Lindstrom brake lever; Blackall-Calvin roller side bearing. Represented by Robert H. Blackall and E. Emery. Space 627.

Boss Nut Company, Chicago, Ill.—Boss lock nut; bolts and rivets. Represented by J. A. MacLean, Fred W. Moore, J. W. Coleman, J. W. Fogg and A. MacLean. Spaces 370-371.

Bowser & Company, Inc., S. F., Fort Wayne, Ind.—Tanks and self-measuring pumps for the receipt, storage, distribution and checking of oils and similar liquids; paint handling and mixing equipment. Represented by E. M. Savercool, W. T. Simpson, J. R. Sibley and P. E. Krider. Space 28.

Bradford Draft Gear Company, New York, N. Y.—Bradford high capacity rocker type draft gear; triple spring draft gear; structural draft arm; structural draft arm and draft gear combination. Represented by Horace Parker, Harry F. Lowman, Floyd K. Mays, Chas. F. McCuen, W. A. McWhorter, Edward H. Smith and H. C. Priebe. Spaces 554-555.

Brosius, Edgar E., Pittsburgh, Pa.—Models of Brosius automatic single hoist grab buckets; single hook grab buckets and charging machines. Represented by D. W. Allan. Space 711.

Brown & Company, Inc., Pittsburgh, Pa.—Staybolt and engine bolt iron samples. Represented by J. Wallace Mitchell, W. J. Caton, L. E. Hassman and R. D. Ballantyne. Space 724.

Buckeye Steel Castings Company, The, Columbus, Ohio.—One Buckeye cast steel type truck bolster for 5½ x 10 axle; two cast steel truck side frames for 5½ x 10 axle; two cast steel yokes for friction gear; one cast steel yoke for tandem gear; one A. R. A. type "D" coupler; Major coupler models. Represented by S. P. Bush, J. C. Whitridge, J. G. Bower, F. H. Bonnet, E. W. Campion, G. T. Johnson, A. H. Thomas, F. J. Cooledge, G. H. Sutherland, H. H. Craiglow, W. C. Speck, H. W. Stertzbach and J. C. Larsen. Spaces 603-605.

Buda-Ross Company, Chicago, Ill.—Sectional models of 1000 and G. W. electric headlight turbo generators. Represented by Mark A. Ross and Harry P. Bayley. Space 550.

Buffalo Brake Beam Company, New York, N. Y.—Brake beams and brake beam parts. Represented by S. A. Crone, A. E. Crone, E. C. Farlow, E. Strassburger, A. Gordon Jones, C. R. Busch and E. F. Gladwell. Space 552.

Bullard Machine Tool Company, Bridgeport, Conn.—Bullard verticle turret lathe; Maxi-mill; Bullard mult-au-matic. Represented by S. H. Bullard, John W. Bray, John Beirne, F. C. Smith and J. H. Shanley. Space 97.

Burden Iron Company, The, Troy, N. Y.—Staybolt iron; engine bolt iron, and iron boiler rivets. Represented by John C. Kuhns. Space 22.

Byers Company, A. M., Pittsburgh, Pa.—Genuine wrought iron pipe; nipples and couplings; wrought iron signal pipe. Represented by J. A Hall, Jr., and S. K. Turner. Spaces 580-581.

Cambria Steel Company, Philadelphia, Pa.—See Midvale Steel & Ordnance Company. Space 657.

Camel Company, Chicago, Ill.—Camel freight car door fixtures; freight car doors; all steel freight car doors; freight car door locks; repair parts for freight car doors; burglar proof devices for freight car doors. Represented by H. E. Creer, W. W. Darrow, P. M. Elliott, H. H. Henricks, Arthur Allan, B. D. Jones and A. B. Wegener. Spaces 534-536.

Carbic Manufacturing Company, Duluth, Minn.—Carbic portable lights; oxy-acetylene welding and cutting outfits; welding torches; cutting torches; carbic cakes; carbic portable acetylene generators. Represented by William H. Norden, M. B. Crouse and D. C. Duncan. Space 325.

Carbo-Hydrogen Company of America, Pittsburgh, Pa.—Metal cutting apparatus and materials. Space 808.

Carborundum Company, The, Niagara Falls, N. Y.—Carborundum and Aloxite wheels; carborundum fire brick and other refractories. Represented by R. M. Onan, R. S. Marvin, C. R. Cox, J. W. Fraser, H. P. Frost and W. L. Meek. Spaces 548-549.

Carnegie Steel Company, Pittsburgh, Pa.—Wrought steel wheels for freight car, passenger train car and engine truck service; industrial wheels; crane track wheels; locomotive piston blanks; gear blanks. Represented by W. G. Clyde, John E. Woods, C. L. Wood, C. C. Cluff, R. B. Woodworth, R. W. Steigerwolt, J. C. Shields, G. R. Schreiner, N. B. Trist, L. C. Bihler and Chas. Orchard. Space 420.

Cashman Tool Company, Waynesboro, Pa.—Cashman adjustable shell reamers. Represented by H. I. Cashman. Space 720.

Chambers Valve Company, New York, N. Y.—Chambers throttle valve. Represented by Frank H. Clark. Space 192.

Champion Rivet Company, Cleveland, Ohio.—Rivets. Represented by D. J. Champion, Jos. R. Wetherald, W. H. S. Bateman and Geo. W. Denyven. Space 388.

Chase & Company, L. C., Boston, Mass.—Goat brand of railroad flushes; Chase Leatherwove—artificial leather. Represented by H. T. Wright and Percy W. Fowler. Space 10.

Chesapeake Iron Works, Baltimore, Md.—A standard Chesapeake electric traveling crane, 10 ton capacity; steel structure; machine work. Represented by F. S. Chavannes, C. H. Michel, J. W. Waters, C. S. Hill, Jr., F. L. Perry, C. M. O'Brien, Fred Brown, Jos. Hoff and Miss Shaw. Spaces 160-162-164.

Chicago-Cleveland Car Roofing Company, Chicago, Ill.—Car roofs; car lines; reinforced ends; all steel ends; pressed steel bolster; uncoupling levers. Represented by R. C. Dudley, T. N. Russell, J. E. Tesseyman, J. L. Stark, T. H. Williams, R. C. Munro and J. W. Bernbaum. Space 506.

Chicago Pneumatic Tool Company, New York City, N. Y.—Boyer riveting and chipping hammers; rivet busters; stay-bolt riveters; pneumatic air drills, all sizes; air grinders; portable electric drills and grinders, all sizes, and accessories. Represented by H. A. Jackson, W. P. Pressinger, W. H. Callan, H. D. Megary, H. L. Dean, T. J. Hudson, C. B. Coates, H. G. Barbee, C. W. Cross, J. M. Stayman, T. G. Smallwood, A. M. Brown, Edw. Aplin, A. C. Andresen, Nelson D. Gatch, J. L. Crowley, E. K. Lynch. Space 621.

Chicago Railway Equipment Company, Chicago, Ill.—Moving picture film showing brake beams, their manufacture and use; brake beams; brake beam supports; side bearings. Represented by E. B. Leigh, C. Haines Williams, F. T. De Long, G. N. Van Sweringen, E. E. Griest, R. J. Sheridan, E. G. Busse and E. A. Lebeau. Space 640.

Chrobaltic Tool Company, Chicago, Ill.—High speed milling cutters; tire forming tools. Represented by W. B. Sullivan, L. H. Whiteside, C. R. Canfield and C. M. Conner. Spaces 726-728.

Cisco Machine Tool Company, Cincinnati, Ohio.—One geared head engine lathe. Represented by Charles Morton. Spaces 121-124.

Clark Car Company, Pittsburgh, Pa.—One 30-yard extension side dump car on exhibit track; reception booth on pier. Represented by H. E. Chilcoat and R. L. Mason. Space 722.

Cleveland Pneumatic Tool Company, The, Cleveland, Ohio.—Cleveland pocket-in-head riveting hammers in several sizes; 27 types and styles of air drills, comprising corner drills, compound drills, rotary drills, center spindle machines, stay bolt machines for plain and flexible bolts; chipping hammers, sand rammers, valve grinders, emery grinders in several sizes; Bowes air hose couplings; Cleveland neverslip hose clamps; Cleo pressure seated air valves and Cleco air hose fittings riveter holder-ons; stay bolt hammers; mudring riveters; flue beading hammers. Film showing how penumatic tools are made will be run in exhibit space on pier. Theater 10 ft. x 36 ft. built on our exhibit space. Represented by H. S. Covey, Arthur Scott, Chas. Garner, Guy Gregory, F. E. Schwarze, R. E. Manning, H. C. Newton, F. H. Burr, L. W. Greve and Geo. H. Hall. Spaces 327, 329, 331, 333.

Cleveland Punch & Shear Works Company, The, Cleveland, Ohio.—Punching machine and six interchangeable attachments, also small tools. Represented by W. C. Sayle, R. E. Graves, C. W. Hancock, R. E. Howells, P. J. Hopkins and W. J. Stewart. Spaces 159, 161.

Cleveland Twist Drill Company, The, Cleveland, Ohio.—Twist drills and reamers. Represented by E. C. Peck, W. E. Caldwell, H. P. Jenson, R. D. Boltey, Francis Kelly, H. G. Smith and R. G. Berrington. Space 97.

Clipper Belt Lacer Company, Grand Rapids, Mich.—Demonstrating method of belt lacing with clipper machine and hooks. Represented by C. P. Field. Space 314.

Commonwealth Steel Company, St. Louis, Mo.—For locomotives; models cast steel tender frames; tender trucks; trailer trucks; cradles; pilots and pilot beams; for passenger-train cars; combination double body bolster and platforms; cast steel one-piece upright end frames; cast steel trucks. Represented by H. M. Pflager, Geo. E. Howard, Boone V. H. Johnson, Charles S. Shallenberger, C. F. Frede, Wm. M. Sheehan, Geo. H. Gibson and H. R. Bartell. Spaces 386-387.

Consolidated Car-Heating Company, Albany, N. Y.—Locomotive steam heat equipment; steam hose couplers; steam traps; end train pipe valves; inlet valves. Represented by W. S. Hammond, Geo. B. Culver and H. L. Hawley. Space 530.

Consolidated Expanded Metal Companies, The, Philadelphia, Pa.—Expanded metal reinforcement for concrete; expanded metal mesh for machine guards, shop partitions, elevator enclosures and window guards; steelcrete expanded metal lath. Represented by T. R. Herbest, Jr., E. A. Kirkpatrick, A. V. Spinosa and H. B. Chess. Space 713.

Crane Company, Chicago, Ill.—Locomotive brass valves, railroad unions and railroad union fittings; locomotive blow-off valves; locomotive pop valves, brass railing fittings. Represented by John B. Jordan and Fred W. Venton. Spaces 502-504.

Crosby Steam Gage & Valve Company, Boston, Mass.—Pressure gages, pop safety valves, blow-off cocks and whistles. Represented by J. J. McCormick and E. L. Taylor. Space 632.

Curtain Supply Company, The, Chicago, Ill.—Car curtains; car curtain fixtures; metal shade rollers; vestibule passageway equipment; canvas vestibule diaphragms; steel vestibule diaphragms; brass window sash; brass window screen; vestibule upper buffer springs. Represented by Holmes Forsyth, T. W. Holt, R. F. Hayes, R. L. Brown and T. P. O'Brian. Space 638.

Cutler-Hammer Manufacturing Company, The, Milwaukee, Wis.—A. C. and D. C. machine tool controller equipment. Represented by T. D. Montgomery, H. W. Stevens and R. H. MacGillivray. Space 743.

Dale-Brewster Machinery Company, Inc., New York, N. Y.—Rivett lathes Milwaukee shapers. Represented by J. J. Dale and Robert Lassiter. Space 112.

Damascus Brake Beam Company, Cleveland, Ohio.—Anglrod, channelrod, Waycott freight and Waycott special brake beams; Brascott ladders; anti-creeping stake pockets; collapsible stake pockets; one piece forged struts for brake beams. Represented by C. D. Jenks and Edward A. Mayhew. Space 619.

Davis Boring Tool Company, St. Louis, Mo.—Full line of Davis expansion car wheel and shop boring tools; Davis micrometer adjustable reamers. Represented by William Morgan and C. C. Koeln. Space 304.

Davis-Bournonville Company, Jersey City, N. J.—General line of oxy-acetylene cutting and welding apparatus. Represented by W. W. Barnes and H. R. Swartley, Jr. Spaces 804-805.

Davis Brake Beam Company.—See Liberty Steel Products Company. Space 539.

Davis Machine Tool Company, Inc., Rochester, N. Y.—One 14-in. close coupled tool room lathe; 16-in. close coupled tool room lathe—(new); 16-in. cone type shaper with swivel table—(new); No. 1 keyseating machine, 24-in. boring, forming and chucking lathe; 24-in. shaper and power down feed. Represented by J. M. Fitzgerald and C. H. Spaulding. Spaces 99-101-103.

Dayton Pneumatic Tool Company, The, Dayton, Ohio.—Complete new line of pneumatic riveting, chipping hammers and sand hammers. Represented by A. B. Hilton, L. B. George, A. B. Clausen, G. C. Towle and L. B. Smyser. Space 704.

Dearborn Chemical Company, Chicago, Ill.—Dearborn water treating preparations for prevention of scale formation, corrosion and foaming in locomotive boilers; No-ox-id rust preventive. Represented by George R. Carr, Grant W. Spear, J. D. Purcell, W. H. Kinney, and D. H. Amsbary. Spaces 6-8.

Detroit Lubricator Company, Detroit, Mich.—Several models of Detroit locomotive lubricators and working model of "Detroit" automatic flange oiler. Represented by H. I. Lord, W. H. Perrine, A. G. Machesney and A. D. Homard. Space 207.

Paul Dickinson, Incorporated, Chicago, Ill.—Engine house smoke jacks, photos and models; building ventilators; camp car and caboose stove jacks; chimneys for small buildings. Represented by A. J. Filkins and D. B. Wright. Space 203.

Disston, & Sons, Henry, Inc., Philadelphia, Pa.—Milling saws—solid and inserted tooth; metal band saws; hack saw frames; hack saw blades—hand and machine; files of all kinds; metal slitting saws. Represented by J. H. Dorrington, W. G. Paul, Edward McKenna and Wm. R. Kendall. Space 186.

Dixon Crucible Company, Joseph, Jersey City, N. J.—Flake lubricating graphite; hub liner grease; brake cylinder lubricant; centerplate grease; engine front finishes; boiler graphite; belt dressings; graphite compound; silica-graphite paint; crucibles; crayons. Represented by L. H. Snyder, Wm. Ernst, W. A. Houston, H. A. Nealley and J. J. Tucker. Space 24.

Dixon Valve & Coupling Company, Philadelphia, Pa.—Air brake hose nipples; car heat hose nipples; couplings for water, steam and air hose; "Boss" high pressure hose coupling; King malleable iron hose bands. Represented by H. W. Goodall, A. W. Swartz and N. S. B. Greene. Space D.

Draper Manufacturing Company, Port Huron, Mich.—Samples of flew welder hollow balanced brass balls; valve facing tools; ball check valves. Represented by J. F. Draper and D. C. Carey. Space 532.

Dressel Railway Lamp Works, The, New York, N. Y.—Reception booth. Represented by F. W. Dressel, F. W. L. Dressel, H. S. Hoskinson and B. P. Claiborne. Space 628.

Duff Manufacturing Company, The, Pittsburgh, Pa.—Inverted high speed ball bearing screw jacks; track jacks with square socket levers; new style journal box jacks; car and locomotive jacks. Represented by G. E. Anderson, E. A. Johnson, T. A. McGinley, C. A. Methfessel, C. N. Thulin and G. E. Watts. Space 401.

Dunbar Manufacturing Company, Chicago, Ill.—Step boxes; Kass safety tread material; diaphrams; vestibule curtains and fixtures; steel flooring; steel doors; anti-pinch shields; tail gate. Represented by H. U. Morton, C. D. Morton, Wm. Wampler, H. B. Chamberlain, G. H. Ord and A. Koenig. Space 609.

Dunn Company, W. C., Cincinnati, Ohio—Pearce journal truing machine. Represented by William Callahan and W. C. Dunn. Space 187.

Duntley Pnuematic Tool Company, Chicago, Ill.—Duntley riveting, scaling and chipping and calking hammers; rivet cutters; electric drills; air drills; rivet sets; all accessories for pneumatic tools. The new Duntley sleeve valve for riveting hammers. Represented by W. O. Duntley, W. M. Hankey, C. A. Duntley, E. A. Warnock, Geo. A. Barden and Robt. K. Crawford. Space 712.

Edgewater Steel Company, Pittsburgh, Pa.—Locomotive tires; rolled steel wheels. Represented by W. V. D. Wright, L. O. Cameron, G. D. Jackson and J. H. Baily. Space 328.

Edison Storage Battery Company, Orange, N. J.—Edison storage batteries for car lighting, signaling, multiple unit control and industrial trucks. Represented by Chas. E. Sholes, John Kelly, D. C. Wilson, A. M. Andersen and A. S. Knox. Space 636.

Edna Brass Manufacturing Company, The, Cincinnati, Ohio.—Locomotive injectors; locomotive lubricators; locomotive boiler check valves; Edna reflex water gauge; duplex water gauge; locomotive coal sprinkler; locomotive fire extinguisher. Represented by D. B. Joseph, E. O. Corey, H. A. Glenn, M. J. Mullen, R. D. Oatman, C. B. Randall and W. W. Scott. Space 316.

Edwards Company, Inc., The O. M., Syracuse, N. Y.—Window fixtures; sash balances; metal extension platform trap doors. Represented by O. M. Edwards, Harold Edwards, J. J. Edwards, E. F. Chaffee, C. H. Rockwell and A. W. Acker. Spaces 527-529-531.

Edwin Harrington, Son & Company, Inc., Philadelphia, Pa.—Harrington multiple spindle drilling machines. Harrington peerless and screw chain hoists and trolleys for operation on overhead I-beam track. Represented by A. H. Harrington, Roger Sherron, W. J. Somerset, M. W. Christian, G. W. Schwager, G. N. Larer and Gustav Westlin. Spaces 28-30.

Electric Arc Cutting & Welding Company, Newark, N. J.—A. C. arc weld and rivet cutting. Represented by O. D. Corbett, C. J. Holslag, C. S. Libby, H. W. Livermore and E. S. Fay. Space 800.

Electric Auto Lite Corporation, Toledo, Ohio.—The Willys light with U. S. L. batteries. Represented by E. J. Blais. Space 315-317-319.

Electric Controller & Manufacturing Co., Cleveland. Ohio.—EC&M automatic compensator, providing push button control of A. C. shop motors EC&M type ZB push button operated starting switch; automatic starters and machine tool controllers for direct current; Youngstown safety limit stop for crane duty; crane protective switchboard. Represented by R. G. Widdows, J. C. Snyder and H. K. Hardcastle. Space 141.

Electric Railway Journal, New York, N. Y.—Electric Railway Journal; McGraw electrical directories; Electrical World; American Machinist, Power, Engineering and Mining Journal; Electrical Merchandising; Coal Age; Journal of Electricity; Chemical and Metallurgical Engineering; Engineering News-Record, Ingenieria Internacional. Represented by H. W. Blake, H. V. Bozell, C. W. Squier, A. C. Davison, J. E. Mason, C. A. Babtiste, W. K. Beard and David Cameron. Space 5.

Electric Service Supplies Company, Philadelphia, Pa.—"Golden Glow" locomotive headlights, sheet metal and cast iron types; keystone turbo generators; "golden glow" and "crystal" mirror glass reflectors; locomotive headlight switches; marker lights; classification lights; lamp guards; flood lights and searchlights. Represented by Chas. J. Mayer, A. H. Englund, J. W. Porter, H. G. Lewis, T. M. Childs, J. R. McFarlin, L. A. Darling and J. G. Dellert. Spaces 760-762.

Electric Storage Battery Company, The, Philadelphia, Pa.—Body hung, constant voltage, axle lighting equipment, complete with hand lever belt tension device; truck type generator; storage batteries; "Chloride Accumulator" giant jar assembly for car lighting; Exide and Ironclad Exide for signal and industrial truck service. Represented by J. Lester Woodbridge, T. L. Mount, F. G. Beetam, W. Van C. Brandt and H. E. Hunt. Space 624.

Elliott-Fisher Company, Harrisburg, Pa.—Accounting, bookkeeping, billing, recording machines. Represented by Charles A. Slingerland and Wm. R. Busch. Spaces 736-738.

Elvin Mechanical Stoker Company, New York, N. Y.—Elvin locomotive stoker. Represented by Frank H. Clark, John B. Given, A. G. Elvin, A. B. Fahnestock and H. D. Eckerson. Space 192.

Elwell-Parker Electric Company, The, New York, N. Y.—Electric storage battery industrial trucks. Represented by Lucian C. Brown, George W. Brown, F. B. Neely, F. B. Fink, C. C. Dietz, J. M. Brown, R. C. Howell, S. H. Ford and W. G. Lockwood. Space 341.

Emmert Manufacturing Company, Waynesboro, Pa.—Emmert universal vises; machinists' vises; drawing instruments and adjustable drawing boards; disc and spindle sanders. Represented by H. S. Kuhn, Edward Gordon and A. G. Blazier. Space G.

Enterprise Railway Equipment Company, Chicago, Ill.—Models illustrating gondola, general service, hopper, ballast, ore, grain and combination cars; also door operating mechanisms for same. Represented by Argyle Campbell, A. E. Zimmer and Wm. F. Batho. Spaces 582-583.

Everlasting Valve Company, New York, N. Y.—Everlasting valve. Represented by John H. Allen, Wylie G. Wilson and Edward N. Corning. Space 509.

Ewald Iron Company, Louisville, Ky.—Staybolt iron. Represented by Baylor Hickman, G. O. Boomer, S. F. Sullivan, E. V. Shackleford, John P. Boorke, R. F. Kilpatrick and George Eisele. Space 535.

Fairbanks Company, The, New York, N. Y.—Machine tools; Radbore heads for boring square holes; valves; Dart unions. Represented by Robert E. Post and John R. Meginnis. Spaces 324-326.

Fairbanks, Morse & Company, Chicago, Ill.—Oil engine, direct-connected to electrical generator in operation; motor-driven centrifugal pump, direct-connected in operation; locomotive water crane; motor cars. Represented by F. M. Condit, E. J. Coverdale, E. C. Golladay, G. Howard, J. L. Jones, E. Lang, E. E. Pendray, Stephen Smith, A. A. Taylor, H. E. Vogel and C. H. Wilson. Space 95.

Fire Gun Manufacturing Company, Inc., New York, N. Y.—Hand fire extinguishers of the carbon tetrachloride type, in three sizes; No. 0 1-quart capacity; No. 1 1¼-quart capacity; No. 2, 1½-quart capacity. Represented by H. E. Tunnell. Space 739.

Flannery Bolt Company, Pittsburgh, Pa.—F. B. C. welded flexible staybolts, flexible crown staybolts and boiler section under test; Tate flexible staybolts; crown adjustable staybolts and marine flexible staybolts. Tools for proper application of "F. B. C." and "Tate" products. Represented by J. Rogers Flannery, B. E. D. Stafford, F. K. Landgraf, E. S. Fitzsimmons, Wm. M. Wilson and George E. Howard. Spaces 590-591.

Flower Waste & Packing Company, Bayonne, N. J.—Journal box packing. Represented by F. J. Clair and P. J. Clair. Space 732.

Foamite Firefoam Company, New York, N. Y.—Approved Foamite Firefoam extinguishers of various sizes; chemical recharges for the extinguishers; Foamite fire pails. Represented by H. J. Marsh and A. R. Thayer. Space 47.

Ford Company, The J. B., Wyandotte, Mich.—Sample jars of cleaning materials and small model cleaning tanks showing agitation with air and steam. Represented by W. E. Ratz, G. E. Gordon, George Lawrence, B. N. Goodell, C. S. Tompkins and W. P. Scott. Space 519.

Fort Pitt Spring & Manufacturing Company, Pittsburgh, Pa.—Coil and elliptic springs. Represented by William McBride, Fred A. Meckert, R. L. Leitch, Atwood Paxson, Maurice Joy and L. O. Cameron. Space 710.

Foster Company, The Walter H., New York, N. Y.—Improved turning and threading machine equipped for radial, crown and side stays; turning and threading from forged blanks; N. E. W. semi-automatic spacing and punching machine, power feed; belt or motor drive. Represented by Walter H. Foster, J. A. Eden, Jr., H. L. Kenah and N. E. Woods. Spaces 135-137.

Franklin Railway Supply Company, Inc., New York, N. Y.—Ragonnet type B reverse gear; automatic adjustable driving box wedge; driving box lubricator; No. 8 fire door, Franklin steam grate shaker; McLaughlin flexible conduit; Franklin ball joint; two-wheel engine truck; radial buffer; unit safety bar; No. 9 fire door; universal valve chest; Booster engine on exhibition track. Represented by J. S. Coffin, S. G. Allen, H. F. Ball, W. F. Coyle, J. L. Randolph, C. W. Floyd Coffin, Harry M. Evans, Bertram S. Allen, S. D. Rosenfelt, W. T. Lane, Montague H. Roberts, F. W. Martin, Frank R. Peters, Paul Weiler, John L. Bacon and Thomas L. Reed. Spaces 414-416.

Frontier Chuck & Tool Company, Buffalo, N. Y.—Lavoie air chucks. Represented by George T. Aitken. Space 115.

Frost Railway Supply Company, The, Detroit, Mich.—Harvey friction spring gears in different sizes; Detroit metal weather strip. Represented by Harry W. Frost, George A. Cooper and George L. Harvey. Space 560.

Fuller Engineering Company, Allentown, Pa.—Fuller pulverized coal locomotive stoker; coal pulverizing and handling equipment. Represented by W. D. Wood and A. G. Kinyon. Space 11.

Fuller Lehigh Company, Fullerton, Pa.—See Fuller Engineering Company. Space 11.

Futrell Coupler Company, Streator, Ill.—Steam and air coupler for railway cars. Represented by T. J. Futrell and W. H. Havlin. Space 228.

Galena-Signal Oil Company, Franklin, Pa.—Reception booth, Represented by L. F. Jordan, J. E. Linahen, W. A. Trubee, W. J. Walsh, W. P. Wescott, W. O. Taylor, P. J. Stack, E. G. Johnson, J. E. Bunn, G. E. McVicar, W. F. Walsh, G. L. Morton and D. A. Eupank. Space 32.

Garlock Packing Company, The, Palmyra, N. Y.—Air pump and throttle, slip and ball joint, and power reverse gear packing; compressor and accumulator, steam hammer and power plant packing; gaskets and pump valves; flexible metal packing. Represented by H. J. Ramshaw, C. W. Sullivan, E. O. Roby, W. G. Cook, Phil Arnold, B. J. Kniest, I. McAllister, J. E. Hillerman, A. C. Hirschman, H. A. Clark and L. P. Duggan. Space 516.

Garratt, L. W., Pittsburgh, Pa.—Neville air pump lubricator; Virginia dust guard. Represented by L. W. Garratt. Space 143.

Geist Manufacturing Company, Atlantic City, N. J.—Wiederwax preheater for preheating preparatory to acetylene welding. Represented by Carlton Geist, G. M. Calmback and L. N. Yetter. Space A.

General Electric Company, Schenectady, N. Y.—Automatic arc welding; hand arc welding; locomotive headlight sets; industrial control equipments; miscellaneous motors. Represented by J. G. Barry, W. J. Clark, C. C. Pierce, F. S. Hartman, John Roberts, R. E. Woolley, J. M. Hollister, L. S. Thurston, W. L. Merrill, John Eaton, C. K. West, C. Dorticos, W. T. Richmond and L. W. Shugg. Spaces 165-173.

Germain Company, The, Pittsburgh, Pa.—Model cross section of a wooden freight car, showing construction and grades of lumber customarily used; cross sections of yellow pine cross ties and piling, treated and untreated; yellow pine decking, car siding, lining and roofing, in all grades. Complete assortment of railroad timber from all parts of the U. S. Represented by C. W. Cantrell, J. H. Austin, Jr., and Ralph Lane. Space 37.

Gibb Instrument Company, Detroit, Michigan.—Zeus A. C. arc welding apparatus. Represented by E. S. Hurd, Chas. Opperman, R. D. Thomas and J. M. Hayes. Space 35.

Gillespie & Company, A. W., Chicago, Ill.—One Economy locomotive fire door; one Henrikson journal bearing boring machine. Represented by A. W. Gillespie and J. S. Seeley. Space 300.

Globe Seamless Steel Tubes Company, Chicago, Ill.—Cold drawn seamless steel locomotive boiler tubes and mechanical tubing. Represented by A. C. Moore, F. J. O'Brien and J. J. Norton. Spaces 526-528.

Goddard & Goddard Company, Detroit, Mich.—New and improved types of milling cutters. Represented by A. N. Goddard and J. W. Sederquist. Space 754.

Gold Car Heating & Lighting Company, New York, N. Y.—Vapor, combination pressure and vapor, pressure, hot water and electric car heating systems; thermostatic control for all types of car heating systems and buildings; ventilators for railway cars; pressure regulators. Represented by Edward E. Gold, E. B. Wilson, A. B. Strange, F. R. Cooper, E. J. Ronan, W. H. Ivers, J. O. Brumbaugh, A. Sheldon, A. D. Stuver, F. H. Smith and G. E. A. Letourneau. Spaces 350-351-352-353.

Goodall Rubber Company, Inc., Philadelphia, Pa.—Goodall semi-metallic air brake hose; car heat, signal, switch, boiler washout and tender hose; mechanical rubber goods. Represented by H. W. Goodall, A. W. Swartz and N. S. B. Greene. Space D.

Gould Coupler Company, New York, N. Y.—Automatic slack adjusters; M. C. B. journal boxes; friction draft gears; couplers; electric car lighting; locomotive headlight equipment; storage batteries. Represented by Charles A. Gould, W. F. Richards, J. W. Reifsnyder, G. B. Young, C. E. Rood, W. H. Sauvage, P. H. Simpson, Charles A. Gould, 2d, G. R. Berger, W. F. Bouche and W. R. Shedd. Space 213.

Gould & Eberhardt, Newark, N. J.—One 28" Invincible type shaper arranged with constant speed Westinghouse motor drive and selective type gear box. Represented by H. Ezra Eberhardt and Charles L. Cameron. Space 181.

Grand Rapids Grinding Machine Company, Grand Rapids, Mich.—Grand Rapids universal cutter, reamer and tool grinders. Represented by B. C. Saunders and J. DeKoning. Space 191.

Greenfield Tap & Die Corporation, Greenfield, Mass.—Working display of No. 1 cutting-off machine; a No. 36 threading machine; and Maxi taps for staybolt; taps, dies, screw plates, reamers, pipe tools and gages. Represented by L. H. Taylor, W. A. Cook, Ralph Barstow and F. W. Strecker. Spaces 308-310-312.

Griffin Wheel Company, Chicago, Ill.—Chilled iron car wheels. Represented by A. A. Hale, H. N. Scott, F. B. Flinn and Geo. D. Casgrain. Space 559.

Grip Nut Company, Chicago, Ill.—Grip nut products; grip lock nut; holding nut; unit nut; pump piston rod nut. Represented by W. E. Sharp, H. E. Passmore, A. Roberts and H. J. Tremey. Space 190.

Gustin-Bacon Manufacturing Company, Kansas City, Mo.—The Emery brake cylinder lubricant; G-B perfect air pump strainer; G-B reversible driving chuck for staybolts; G-B thermoline valve for tire heating. Represented by John W. Foyle, F. L. Bacon, E. A. Emery, Fred Speer and J. S. Hearons. Space 737.

Hale & Kilburn Corporation, Philadelphia, Pa.—Coach seats; reclining chairs; car flooring. Represented by W. M. Swope, H. R. Rochester, P. J. Tucker, A. F. Old, H. C. Minor and R. H. Pilson. Spaces 408-410.

Hammett, H. G., Troy, N. Y.—Triple valve bushing roller; Staytite packing bell ringer. Represented by H. G. Hammett, A. O. Van Der Vort and E. C. Sawyer. Space 512.

Hanna Locomotive Stoker Company, The, Cincinnati, Ohio.—Hanna locomotive coal distributor. Represented by W. T. Hanna, W. A. Benson, J. W. Myers and F. E. McCown. Space 183.

Haring, Ellsworth, New York, N. Y.—Elhar high speed steel and tool steels; non-ferros metals in wires and sheets for special purposes. Resistance wires. Represented by Ellsworth Haring. Space 20.

Hauck Manufacturing Company, Brooklyn, N. Y.—Oil burning equipment such as: Tire heaters, steel car repair burners, rivet forges, furnace burners, hand torches, thawers, sprayers. Steamers for sterilizing purposes; tool dressing furnace; brazing forge; melting furnace; low pressure burner; paint burner; locomotive fire kindler; steam testing burner. Represented by M. R. Jarvis, John D. Moore and F. E. Giersch. Spaces 188-806.

Heald Machine Company, The, Worcester, Mass.—Style No. 60, cylinder grinding machine; style No. 70, internal grinding machine; style No. 85, internal grinding machine; style No. 20, rotary surface grinding machine. Represented by S. T. Massey, J. N. Heald, L. C. Kenyon and S. M. Hershey. Spaces 129-131.

Herbert, Ltd., Alfred, New York, N. Y.—No. 1, Alfred Herbert hexagon turret lathe; No. 4, universal turret lathe; No. 9, combination turret lathe; No. 2, Lumsden power oscillating tool grinder; No. 12, ball bearing plain cup wheel grinder; Alfred Herbert B. B. twist drill grinder; entire line of small tools and supplies. Represented by E. D. Mitchell, J. C. Blair, J. W. Blackford, C. J. Albin, C. R. White, E. G. Blake, E. R. Wood, Felix Harmer, George Boucher and B. Martin. Spaces 168-170.

Heywood Brothers and Wakefield Company, Wakefield, Mass.—Railway car seats; canvas lined rattan car seat webbing. Represented by Bertram Berry, G. E. Cornwall, E. C. Lang, C. A. Van Derveer, F. N. Grigg, W. E. Foreman, F. J. Neale and C. G. Elliott. Spaces 520-524.

Horrocks Desk Company, Herkimer, N. Y.—Danight lubricator on M. C. B. brass with letters from M. M.'s. Represented by G. P. Simmons. Space 761.

Hunt-Spiller Manufacturing Corporation, South Boston, Mass.—Locomotive parts made of Hunt-Spiller gun iron; cylinder bushings; cylinder packing; solid pistons; bull rings; piston valve bushings; tee rings; piston valve packing; crosshead shoes; side rod and knuckle pin bushings for freight service; air pump bushings and packing; driving boxes; pedestal shoes; pedestal wedges; eccentrics and eccentric straps. Represented by W. B. Leach, J. G. Platt, F. M. Weymouth, V. S. Ellet, A. B. Root, Jr., E. J. Fuller, C. L. Galloway and F. B. Hartman. Spaces 562-563.

Hutchins Car Roofing Company, Detroit, Mich.—Car roofs; steel car ends. Represented by F. M. Whyte, M. F. Ryan, F. C. Dunham, J. F. Comee and A. R. Wilson. Space 525.

Hyatt Roller Bearing Company, New York, N. Y.—Large model of Hyatt Bearing in operation. Housing cut away to show just how the different parts function. Bearings in operation in housings made of glass to show just how the helically wound Hyatt rollers circulate the oil. Sample bearings and parts to show construction, manufacture and finished product. A great deal of interesting data on economies effected by Hyatt Bearings in freight and baggage handling trucks. Complete bulletins covering all industrial applications of the Hyatt Bearing. Represented by L. W. Iliff, M. F. Lawrence, P. C. Gunion, H. K. Porter, H. L. Littell, D. Gleisen, G. O. Helmstaedter, F. H. Knight and R. W. Young. Space 620.

Independent Pneumatic Tool Company, Chicago, Ill.—Thor pneumatic drills, reamers, grinders, hammers, hoists, rammers and electric drills and grinders. Represented by J. D. Hurley, R. S. Cooper, R. T. Scott, 2nd, A. G. Anderson, H. F. Finney, F. J. Passino, H. F. White, V. W. Robinson, W. H. Rosevear, W. A. Nugent and A. L. Schuhl. Spaces 556-557.

Individual Drinking Cup Company, Inc., New York, N. Y.—Dixie cup vending machines and cups; Dixie cup dispensing machines; sant-kerchief vending machines, for passenger car and station use. Represented by Arthur R. Lillicrapp and M. E. Morrison. Space 15.

Industrial Works, Bay City, Mich.—Locomotive, wrecking, wharf, gantry, transfer and pillar cranes; combination crane pile drivers and crane steam shovels, pile drivers, rail saws, grab buckets, transfer tables and steam pile hammers. Represented by W. W. Clements, James Shearer, 2nd, George T. Sinks and Wm. L. Brown, 3rd. Space 330.

Ingersoll-Rand Company, New York, N. Y.—Little David pneumatic tools and appliances. Represented by Geo. A. Gallinger, Walter A. Johnson, F. J. Smith, Geo. S. Johnston, F. W. Gaw, Geo. C. Williams, L. W. Schnitzer, J. F. Watson, J. A. Sanford and E. C. Geither. Spaces 572-573.

International Couplers Company, Pittsburgh, Pa.—The White automotic metallic train-pipe coupling system; auto-tite flexible expansion couplings for engine and tender lines; auto-tite flexible pipe joints; auto-tite traverse expansion joints. Represented by Walter Carman White, E. B. Lawson, Nathan W. Stem and J. H. Lonsdale. Space 703 and on exhibit track.

International Machine Tool Company, Indianapolis, Ind.—One 16-18 in. and one 24-26 in. Libby heavy duty turret lathes. Both machines tooled up and operating on railroad work. Represented by J. A. Villard, C. M. Hamersly, C. F. White, J. K. Robson, A. C. L. Black and Geo. A. Crawshaw. Space 180.

Iron City Products Company, Pittsburgh, Pa.—Rees double worm gear drive jacks for railway and industrial purposes; passenger cars and trucks. Represented by E. E. Arnold and C. A. Conklin. Space 404.

Irving Iron Works Company, Long Island City, N. Y.—Irving subway fireproof metallic flooring and Irving safsteps. Represented by W. E. Irving, P. L. Price, H. H. Bunker, W. H. Lown, J. M. Madden and H. H. Schuldt. Space 758.

Jacobs Manufacturing Company, The, Hartford, Conn.—Jacobs improved drill chucks. Represented by Joseph H. Hazley and G. Albert Englund. Space 132.

Jefferson Union Company, Lexington, Mass.—Jefferson unions; union ells and tees; flange unions. Represented by Daniel T. Groff. Space 16.

Johns-Manville Company, H. W., New York, N. Y.—The 85% magnesia pipe covering and boiler lagging; J-M sponge felted pipe covering and blocks; miscellaneous J-M pipe coverings and transite and ebony asbestos wood; asbestos shingles; high temperature and insulating cement; Mastic flooring; J-M built-up and ready roofing; Salamander insulation; Keystone hair felt and standard hair felt; spiral locomotive pipe covering; power reverse gear packing; Mallet locomotive packing; J-M expander rings and packing cups; friction tape and splicing compounds; Transite asbestos wood smoke jacks; miscellaneous packing materials; Vulcabeston gaskets and washers; J.-M. fire extinguishers; Transite ventilators. Represented by J. E. Meek, G. A. Nicol, J. C. Younglove, Geo. Christenson, J. H. Trent, H. G. Newman, C. E. Murphy, F. J. Horne, R. A. Hamaker and W. J. Stewart. Spaces 586-587.

Johnson Bronze Company, New Castle, Pa.—Babcock Water gage protector. Represented by Robt. Redding and F. H. Babcock. Space 373.

Joliet Railway Supply Company, Chicago, Ill.—Brake beams; truck bolsters; side bearings; journal boxes. Represented by F. L. Sivyer, J. H. Slawson, C. A. Carscadin, Jas. E. Simons, and Hamilton Vose. Space 611.

Jones & Company, B. M., Inc., New York, N. Y.—Fractures of double mushet high speed steel; Taylor's best Yorkshire iron. Represented by Fred J. Holden, W. S. Murrian, Ray G. White, W. H. White and Austin Savage. Space 38.

Jones & Laughlin Steel Company, Pittsburgh, Pa.—Various products, including hot rolled sections; cold-finished section; wire; wire fence; wire nails; tubular products; tin and black plate. Represented by A. A. Wagner, J. F. Replinger, Roland Gerry, Ralph Rowles, Robert Geddis, G. C. Fogwell, Robert Kilgore and George B. Mitchell. Spaces 409-411.

Joyce-Cridland Company, The, Dayton, Ohio.—Lifting jacks of all kinds, including self lowering jacks in 50 and 75-ton capacities, all heights. Full automatic geared jacks; full automatic lever jacks; screw jacks of all kinds; plain lever jacks; traversing jacks; hydraulic jacks; pole and emergency jacks. Represented by W. F. Bippus, A. S. Beattys, C. D. Derby and R. L. Skidmore. Space 607.

Justice & Company, Philip S., Philadelphia, Pa.—Reception booth. Represented by Philip J. Mitchell. Space 509.

K-G Welding & Cutting Company, Inc., New York, N. Y. Compressed gas, welding and cutting torches; regulating valves; equipment and supplies. Represented by Wm. D. Flannery, George B. Malone, Wm. McCarthy, Wm. M. Munn and Peter Norren. Space 57.

Karry Lode Industrial Truck Company, Inc., Long Island City, N. Y.—Industrial trucks and tractors. Represented by J. M. Breitenbach, W. W. White and H. A. Spaulding. Spaces 332-334.

Kaustine Company, Inc., Buffalo, N. Y.—Kaustine chemical toilet systems and hydro kaustine iron enameled septic tanks. Represented by J. H. Fotheringham, F. B. Shalters and D. A. Evans. Space 335.

Keller Pneumatic Tool Company, Grand Haven, Mich.—Complete line of Keller-Master riveting, chipping, calking and scaling hammers; jam riveters; holder-ons; sand rammers; pneumatic drills; wood borers and grinders; rivet sets and chisel blanks. Represented by Wm. H. Keller, L. H. Olsen, C. A. Bremmer, J. C. Campbell, W. F. Delaney, W. H. Woody, C. W. Gellinger, J. B. Corby, W. J. Devlin, H. C. Browne and F. S. Eggleston, Jr. Space 197.

Kerite Insulated Wire & Cable Company, Inc., The New York, N. Y.—Reception booth. Represented by Azel Ames, P. W. Miller, J. W. Young, J. A. Benton, B. L. Winchell, Jr., and W. H. Fenley. Space 716.

Keyoke Railway Equipment Company, Chicago, Ill.—Murray cast steel friction draft gear and cast steel coupler yokes. Represented by George C. Murray, R. J. Cook and Edward Walters. Space 309.

Keystone Drop Forge Works, Chester, Pa.—General line of drop forgings. Keystone connecting links; Keystone safety shackle hook. Represented by Geo. H. Berlin and Wm. J. McDevitt. Space 302.

King Optical Company, Julius, New York, N. Y.—Safety goggles; face masks and shields; welding helmets. Represented by Fred W. King and Major J. N. Thomas. Space 745.

Lakewood Engineering Company, The, Cleveland, Ohio.—One Lakewood 703 tier-lift truck; one Lakewood type 701 tractor; one Lakewood No. 810 trailer. Represented by Thos. T. Fauntleroy. Space 220.

Landis Machine Company, Waynesboro, Pa.—One 2 in. Landis double head bolt threading machine; 4 in. Landis pipe threading and cutting machine; 1¼ in. single head leadscrew threading machine; chaser grinder; stationary pipe die head; 1¼ in. Landis automatic die head. Represented by C. N. Kirkpatrick, C. F. Meyer, F. C. Delcher, J. W. Willis, M. M. Lutz, G. M. Stickell, C. M. Creager and H. W. Marker. Spaces 123-125-127.

Latrobe Tool Company, Latrobe, Pa.—High speed twist drills and reamers. Represented by J. B. Moore, W. B. Fetner, F. B. Hull and A. A. Morton. Space 361.

Lehon Company, The, Chicago, Ill.—Mule-hide car roofings; waterproof insulating materials; coach roofings; membranes; roofing and shingles; sill covers; wood-seal. Represented by Tom Lehon and John E. Eipper. Space 18.

Lewis Draft Appliance Company, Chicago, Ill.—Lewis automatic draft and back pressure control. Represented by J. D. Purcell and D. M. Lewis. Space 163.

Liberty Manufacturing Company, Pittsburgh, Pa.—Liberty type air operated cleaners for arch tubes of locomotive boilers and for fire and water tubes of stationary boilers, also Lagonda type machines for same purpose. Represented by Harry A. Pastre. Space 96.

Liberty Steel Products Company, Inc., Chicago, Ill.—Davis solid truss brake beams for passenger, locomotive tender and freight equipment; Liberty built-up brake beams; Davis pressed steel journal box lids; Libco sectional steel buildings. Represented by Chas. J. Graham, E. H. Pape, J. M. Brown, R. P. Townsend, S. W. Midgley, J. M. Borrowdale, A. W. Preikschat, W. T. Kilborn, M. J. Folensbee, W. E. Fowler, Jr., A. D. Brown, T. L. Lawry, C. F. Flood and Geo. McP. Minetree. Space 539.

Liberty Tool Corporation, The, Baltimore, Md.—Liberty labor saving tools. Single and double cylinder portable drilling presses; rivet heating furnace; heating torch; backing out punch; heading attachment; bottom riveting rig. Represented by E. Oliver Grimes, Jr., M. J. O'Connor, H. J. Wilson, C. S. Green, M. C. Pearrell, G. L. Degenhard and C. R. Flater. Spaces 215-217.

Lincoln Electric Company, The, Cleveland, Ohio.—Lincoln 200-300 ampere welder; Lincoln motors; Lincoln motor operating under water. Represented by Robt. E. Kinkead, D. C. Anderson and O. P. Lang. Space 803.

Loco Light Company, The, Indianapolis, Ind.—One Loco light generator in operation; one Loco light generator, sectional view; headlight case. Represented by H. H. Tomlinson, C. Vossler, T. D. Kelly, B. Palmer Claiborne and Col. C. E. Bleyer. Space 718.

Locomotive Appliance Company, The, Toledo, Ohio.—Laco type of steam fire door; sleeve valve; throttle valve; valve control cylinders; steam chest; cross head connected valve gear. Represented by Chas. J. Pilliod, Geo. H. Hartman and Dan Searles. Spaces 727-729.

Locomotive Feed Water Heater Company, New York, N. Y.—Boiler feed pump; model of feed water heater; samples of various parts from service. Represented by G. M. Basford, E. A. Averill, W. H. Lovekin, C. R. Fairchild, A. R. Frankhauser, C. R. Hardy, H. V. Jones and W. T. Bennison. Spaces 414-424.

Locomotive Firebox Company, Chicago, Ill.—Working model showing Nicholson thermic syphons; also single syphon shown. Represented by John L. Nicholson, James T. Anthony, Leslie R. Pyle, C. M. Rogers, W. M. Wilson and John Stuart Hawley. Spaces 382-384-385.

Locomotive Lubricator Company, Chicago, Ill.—One sectional model of force feed locomotive lubricator and diaphragm terminal check valve; one working model of the above. Represented by W. J. Schlacks, O. H. Neal and C. W. Rudolph. Space 574.

Locomotive Stoker Company, Pitsburgh, Pa.—Full size type "D" duplex stoker with locomotive backhead; 1/3 size type "D" duplex stoker with locomotive backhead; full size type "D" slope sheet coal pusher. Represented by W. L. Bartholomew, J. J. Byrne, O. B. Capps, W. G. Clark, D. F. Crawford, A. C. Deverell, Harold Gardner, J. J. Hannahan, R. G. Kelley, N. M. Lower, L. E. Osborne, Eugene Prouty, Edward Ryan, L. V. Stevens, Karl M. Steller, A. N. Willsie and H. C. Woodbridge. Spaces 403-405-407.

Locomotive Superheater Company, New York, N. Y.—Steam superheaters for locomotives; fire tube superheater for Scotch marine boilers; Elesco superheater for stationary boilers; pipe coils; steam pyrometers. Represented by G. L. Bourne, F. A. Schaff, R. M. Ostermann, G. E. Ryder, R. R. Porterfield, W. A. Buckbee, H. B. Oatley, C. A. Brandt, Bard Browne, Geo. Fogg, A. C. Loudon, S. Macdonald, A. C. McLachlan, J. E. Mourne, K. E. Stilwell, B. N. Broido and R. A. Holme. Spaces 422-424.

Locomotive Terminal Equipment Association, Chicago, Ill.—Literature pertaining to locomotive terminal equipment. Represented by Frederic A. Gale and H. L. Hilleary. Space 748.

Long, Jr., Company, Chas. R., Louisville, Ky.—Samples of railway paints; paint panels, paint films. Represented by Chas. R. Long, Jr., G. S. Turner, W. H. Heckman, Harry Vissering, J. M. Monroe and S. W. Russell. Space 577.

Lukens Steel Company, Coatesville, Pa.—Reception booth. Represented by Harry Loeb and George L. Gordon. Space 9.

Lunkenheimer Company, The, Cincinnati, Ohio—Valves; lubricators; oil pumps; oil and grease cups; oiling devices; boiler mountings; injectors; ground key work; motor accessories. Represented by Howard J. Evans and Andrew Lauterbach. Spaces 311-313.

Luster Machinery Company, The, Philadelphia, Pa.—One 22-inch Cincinnati geared head lathe; 1 16-inch Cincinnati tool room lathe; 1 16-inch Ohio motor driven shaper. Represented by E. J. Luster. Spaces 149-151.

MacRae's Blue Book Company, Chicago, Ill.—MacRae's Blue Book; MacRae's classified list of railroad officials. Represented by Alex Smith, R. S. Lundy, Chris Anderson, F. O. Rice and Thos. H. MacRae. Space 21.

Mahr Manufacturing Company, Minneapolis, Minn.—Mahr steel car repair torches; boiler shop torches; type "T" and Jiffy torches; babbitt furnaces; rivet forges; calorizors; safety automatic shut-off valves. Represented by W. G. Barstow, R. B. Ecker and A. S. Hayes. Space 538.

Main Belting Company, Philadelphia, Pa.—Anaconda power transmission belting; M. B. C. car lighting belting; Leviathan conveyor belting; "Main" conveyor rollers; style "C" adjustable troughing roller; style "A" troughing roller; styles "R" and "S" return rollers. Represented by E. F. Hiller, H. B. Gramm and W. C. Schreiner. Space 701.

Manning, Maxwell & Moore, Inc., New York, N. Y.—Consoli-

dated safety valves; Ashcroft gauges and gauge testers; Hancock inspirators, boiler check valves; steam valves, and boiler tester, filler and washer; locomotive force feed lubricator. Represented by P. M. Brotherhood, H. D. Carlton, C. L. Brown, P. K. Dayton, J. Soule Smith, F. J. Wilson, J. Briscoe, E. M. Moore, C. Freeman and T. S. Stephens. Spaces 629-631-633.

Massachusetts Mohair Plush Company, Boston, Mass.—Mohair car seat plush and mohair velvets. Represented by William W. Melcher. Space 635.

McCabe Manufacturing Company, Lawrence, Mass.—Working model of pneumatic flanging machine; flanged flue sheets; flanged car parts. Represented by Fred H. McCabe and Hugh McCabe. Space 306.

McConway & Torley Company, The, Pittsburgh, Pa.—Automatic couplers including Pitt pivoted passenger couplers, "D" pivoted passenger couplers and 3-stem pivoted passenger couplers. Represented by Wm. McConway, Jr., Stephen C. Mason, H. C. Buhoup, I. H. Milliken, E. L. Reynolds and W. J. Regan. Spaces 501-503-505.

McCord & Company, Chicago, Ill.—Journal boxes. Represented by Judson A. Lamon and F. W. Craig. Space 610.

McCoy Manufacturing Company, The Elijah, Detroit, Mich.—McCoy Graphite lubricator for valves and cylinders, and for air pump and accessories to each. Represented by Francis H. Warren and Albert L. Stricker. Space 17.

McNab & Harlin Manufacturing Company, Paterson, N. J.—Valves and fittings of iron and brass. Represented by Ernest G. Jarvis. Spaces 719-721.

Metal & Thermit Corporation, New York, N. Y.—Thermit and appliances, sample of square single track crossing, constructed by Thermit welding. Sample of carbon-free metals and alloys produced by the Thermit process. Sample weld on 9″ crank shaft. Materials for demonstrating pipe welding for the purpose of welding locomotive superheater units. Sample of superheater unit so welded. Represented by F. W. Cohen, W. R. Hulbert, H. D. Kelley, H. S. Mann, E. B. Bloom, J. G. McCarty and Wm. Aldrich. Space 184.

Midvale Steel and Ordnance Company, Philadelphia, Pa.—Knobbling furnace and samples showing all steps in the production of genuine old fashioned knobbled charcoal iron and charcoal iron boiler tubes; panels showing tools made of Midvale steels for use in Midvale shops; one Cambria heavy freight axle; one table on which are mounted samples of the larger sizes of sections rolled by the Cambria Steel Company; several samples of steel wheels; samples of piston rod and miscellaneous car forgings. Represented by R. V. Sage, J. C. C. Holding, H. O. Williams, Harry Rowe, James Conner, Samuel Griffith, W. S. Edger, Harry Neele, L. B. Morris, Charles Keenan, F. W. Sager, R. E. Sharp, F. W. Stone, R. E. Dexter, J. E. McLain, H. W. Hibshman, George A. Richardson, George E. Thackray and B. F. Faunce. Space 637.

Miller Saw-Trimmer Company, Pittsburgh, Pa.—Anyangl lighting fixtures. Represented by E. T. Russell, E. T. Spillman, G. E. McCabe and Frank V. Barhydt. Space 734.

Miner, W. H., Chicago, Ill.—Friction draft gears; side bearings; safety hand brakes; refrigerator car door fasteners; drawbar yokes. Represented by B. S. Johnson, J. R. Mitchell, W. E. Robertson, A. E. Biddle, G. Q. Lewis, A. P. Withall, J. F. O'Connor and eGo. A. Johnson. Spaces 584-585.

Monroe Calculating Machine Company, New York, N. Y.—Monroe calculating machine. Represented by J. R. Ramsay, G. W. Laine, J. V. Carroll and S. W. Reed. Space 751.

Mudge & Company, Chicago, Ill.—Solvit compound; Mudge motor cars; Mudge-Peerless ventilators. Represented by Burton Mudge, George W. Bender, Karl J. Eklund and Sherman C. Amsden. Space 201.

Nathan Manufacturing Company, New York, N. Y.—Injectors; lubricators; boiler checks; valves and locomotive fittings. Represented by E. S. Toothe, Otto Best, J. F. Farrell, W. E. Brumble, W. R. Walsh, Richard Welsh, J. C. Currie, W. S. Murrain, E. F. Boyle, W. G. Lockwood, F. C. Davern and W. D. Jenkins. Spaces 578-579.

National Brake Company, Inc., Buffalo, N. Y.—Peacock geared hand brakes for freight, coal, tank and hopper cars; geared hand brakes for baggage, express, mail and all blind-end cars. Two designs. Geared hand brake for Pullman and passenger cars; positive release ratchet brake lever; anti-friction staff bracket. Represented by Frank D. Miller and Wm. D. Brewster. Spaces 705-707.

National Car Equipment Company, Chicago, Ill.—Klasing safety hand brake. Represented by W. L. Kellogg and A. F. Klasing. Space 383.

National Car Wheel Company, Pittsburgh, Pa.—Chilled iron car wheels for 60,000- 80,000- 100,000- and 140,000- capacity cars. Represented by J. H. Yardley, E. H. Chapin, H. L. Garvin, J. F. Weisbrod, R. H. Tate, G. L. Hoen, J. D. Cunningham, H. E. McClumpha, A. Muirhead and A. Batzold. Spaces 572-573.

National Carbon Company, Inc., Cleveland, Ohio.—Columbia dry cells; Columbia hot shot and multiple batteries; Columbia high voltage caustic soda cells; carbon and metal brushes for motors; generators and headlight equipment; lighting and welding carbons; welding paste; carbon plates; carbon packing rings; special forms in carbon and carbon telephone specialties; American flashlights and batteries. Represented by Chas. S. Pflasterer, J. M. Spangler, A. E. Pratt and Walter R. Pflasterer. Spaces 744-746.

National Lock Washer Company, The, Newark, N. J.—Models of car curtains; curtain fixtures, sash locks; sash balances; window packing; national lock washers and Hipower nut locks. Represented by F. B. Archibald, J. Howard Horn, C. H. Loutrel, R. L. Cairncross, Daniel Hoyt and R. B. Cardozo. Space 541.

National Malleable Castings Company, The, Cleveland, Ohio.—Couplers of various types; journal boxes; miscellaneous car castings and railroad devices. Represented by T. W. Aishton, J. J. Byers, A. J. Bazeley, W. E. Coffin, G. R. Farrell, Charles Gaspar, R. T. Hatch, H. T. Krakau, W. C. Lewis, O. W. Loomis, G. V. Martin, H. L. Mausk, C. H. McCrea, Benjamin Nields, Jr., J. A. Slater, S. L. Smith, E. H. Schmidt, E. O. Warner and L. S. Wright. Spaces 613-615.

National Railway Appliance Company, New York, N. Y.—Garland ventilators; Dunham hopper doors; Anglo-American varnish company's products; tool steel gears and pinions; Genesco paint oils; feasible drop brake staffs; Clapp's fire resisting paint; Flaxlinum insulation samples. Represented by B. A. Hegeman, Jr., Charles C. Castle, Harold A. Hegeman, W. C. Lincoln, W. C. Peters, Fred C. J. Dell, C. H. McCormick, J. Turner Martyn and H. W. Bininger. Space 622.

National Railway Devices Company, Chicago, Ill.—Shoemaker vertical fire-doors operated automatically and constantly under air pressure. Represented by Jay G. Robinson, E. J. Gunnison and A. F. Lind. Space E.

National Tube Company, Pittsburgh, Pa.—Reception booth. Represented by George N. Riley, J. T. Goodwin, J. W. Kelly and P. J. Conrath. Spaces 546-547.

New York Air Brake Company, The, New York, N. Y.—Reception booth. Represented by Scott R. Hayes, C. E. Leach, N. A. Campbell, Thomas O'Leary, Jr., William Owens, George Kleifges, O. E. Moore, L. S. Sawyer and N. W. Lyon. Space 30.

Newton Machine Tool Works, Inc., Philadelphia, Pa.—Milling machines. Represented by Nicholas P. Lloyd and Roland G. Holmes. Spaces 117-119-121.

Niles-Bement-Pond Company, New York, N. Y.—Niles 36″-44″ side head boring mill; Pond 5′ right line radial drill; Pratt & Whitney 10″ vertical shaper; Pratt & Whitney small tools and gages; Morris 3′ plain radial drill; Stockbridge 20″ two-piece crank shaper; Aurora 28″ super drill. Represented by Edward L. Leeds, George Mills, D. H. Teas, B. S. Skinner, Charles Lyle, J. L. McCartney, H. Wm. Kopf, Boyd Nixon, N. C. Walpole, H. F. Welch and B. A. Tozzer. Spaces 104-110.

Norton, Incorporated, A. O., Boston, Mass.—Different types of Norton self-lowering speed-controlled jacks—100 ton; 50 ton; 50 ton inverted type—new this year. 35 ton; 25 ton; 25 ton and 35 ton ball-bearing journal jacks. Represented by H. A. Norton, Frank L. Gormley, George R. Law, F. P. Hartshorn, R. D. Bates and C. H. Smith, Jr. Space 551.

Nuttall Company, R. D., Pittsburgh, Pa.—Heat-treated gears

and pinions for electric locomotives and multiple unit cars; pantagraph trolley parts. Represented by J. E. Mullen and R. R. Gartside. Space 134.

Okadee Company, The, Chicago, Ill.—Okadee blower valves; blow-off valves; tender hose couplers; front end hinges; water glass protectors. Okadee automatic drain valves. Represented by A. G. Hollingshead, Harry Vissering, Chas. R. Long, Jr., G. S. Turner, W. H. Heckman and J. M. Monroe. Space 575.

Okonite Company, The, Passaic, N. J.—Okonite rubber covered wires and cables; varnished cambric wires and cables; splicing tape. Manson friction tape. Represented by J. L. Phillips, W. R. Van Steenburgh, J. W. Hackett, J. D. Underhill, C. A. Miller and F. J. White. Space 733-735.

O'Malley Beare Valve Company, Chicago, Ill.—Globe, angle and check, also "Y" body multiplate valves; Perfection gauge cock, water glass drain and squirt hose valves, boiler checks, blow out valves, duplex blow out valve, phosphor bronze and other high class engine bearings. Represented by Edward O'Malley, Thomas O'Malley, J. E. Brown, J. N. Gallagher and Jas. M. Pigott. Space 177.

Onondaga Steel Company, Inc., Syracuse, N. Y.—Spark testing of steel scrap; sample bars high on speed steel. Represented by C. P. Whiting and O. S. Wilcox, Space 378.

Osmer, J. E., Owosso, Mich.—Exhaust pipe and controlling valve for the same. The exhaust pipe will be connected up with an air pipe line, and an operating valve will be attached to the same for operation by those who desire to investigate the operation of the device. Space 602.

Oxweld Railroad Service Company, New York, N. Y. Reception booth. Represented by George Thompson, S. P. DeLano, G. M. Crownover, E. M. Collins, L. C. Ryan, R. W. White, F. C. Hasse, R. P. Browning, A. W. Whiteford, W. F. Thatcher, H. W. Jacobs, A. Lucas, W. M. Beard, C. B. Moore, M. C. Beymer, H. W. Schulze and R. W. Harvey. Space 33.

Page Steel & Wire Company, New York, N. Y.—Armco American ingot iron electrodes and welding wire; ingot iron strand; ingot iron bond wires, telegraph wire, telephone wire, together with the latest developments of the Page company, namely:—Page Armco fence. Represented by W. T. Kyle, C. A. McCune, W. H. Beecker, Jr., E. J. Flood and C. L. Bennett. Spaces 305-307.

Paige & Jones Chemical Company, New York, N. Y.—Boiler feed water treatment; paint oil; core oil. Represented by Fred O. Paige and Harry N. Bennett. Spaces 366-368.

Pantasote Company, The, New York, N. Y.—Agasote headlining, roofs, wainscoting; Pantasote curtain material and seat covering. Represented by John M. High, Wm. A. Lake and Wm. Anderson. Space 400.

Parkesburg Iron Company, The, Parkesburg, Pa.—Small samples charcoal iron boiler tubes for marine, locomotive and stationary boilers. Represented by H. A. Beale, Jr., George Thomas, 3rd., George W. Denyven, R. J. Sheridan, W. H. S. Bateman, J. R. Wetherald, J. A. Kinkead, G. H. Woodroffe, W. P. Canby and G. A. Cardwell. Space 388.

Paxton-Mitchell Company, Omaha, Neb.—Piston rod, valve stem and air pump metallic packing. Represented by C. A. Coons, E. L. Chollman and J. J. Keliher. Space 533.

Penn Iron & Steel Company, Creighton, Pa.—Samples of staybolt and chain iron. Represented by Henry F. Gilg. Space 34.

Penn Seaboard Steel Corp., Philadelphia, Pa.—Reception booth. Space 608.

Pilliod Company, The, New York, N. Y.—Model of locomotive showing Baker valve gear; model of Sentinel low water alarm. Represented by R. H. Weatherly, K. J. Eklund, J. J. Donovan, D. Purdy, Wm. Hoffmann and J. H. Burwell. Space 189.

Pittsburgh Power Reverse Gear Company, Pittsburgh, Pa.—Power reverse gear. Represented by P. E. Donner, A. S. Osbourne and J. G. North. Space 139.

Pocket List of Railroad Officials, The, New York, N. Y.—Pocket List of Railroad Officials. Represented by Charles L. Dinsmore, Harold A. Brown and J. Alexander Brown. Space 5.

Pollak Steel Company, The, Cincinnati, Ohio.—Reception booth, furnishing valuable and expert information regarding manufacture and heat treatment of railway forgings. Represented by D. E. Sawyer. Space 523.

Pratt & Lambert, Inc., Buffalo, N. Y.—The Vitralite railway enamel system. Represented by J. P. Gowing, E. L. Georger and J. R. Mickle. Space 521.

Pressed Steel Car Company, New York, N. Y.—Booth with photographs. Represented by N. S. Reeder, J. F. MacEnulty, C. E. Postlethwaite, K. C. Gardner, H. H. Gilbert, J. S. Turner, W. H. Wilkinson, H. S. Hammond, C. C. Clark, C. W. Mourer, C. H. Jackman, L. O. Cameron, C. A. Lindstrom, J. F. Streib, F. O. Schramm and F. L. Johnson. Spaces 545-601.

Production Machine Company, Greenfield, Mass.—Polishing and grinding machines; lawn mowers for station yards. Represented by W. S. Howe and A. H. Behnke. Space 126.

Pulverized Fuel Equipment Corporation, New York, N. Y.—Reception booth with literature. Represented by A. V. Adamson. Space 422.

Pyle-National Company, The, Chicago, Ill.—A model of the Young valve gear. A complete line of turbo-generators; electric headlight sets; suburban train lighting; headlight cases of all sizes; sheet steel and cast; locomotive cab lamps; back-up lamps; switches; connectors; focusing devices for lamps. Represented by R. C. Vilas, J. Will Johnson, Wm. Miller, A. N. Martin, C. P. McGinnis, T. P. McGinnis, R. L. McIntosh, O. W. Young, R. L. Kilker, W. T. Bretherton, G. E. Haas and W. Smith. Spaces 602, 604, 606.

Q. & C. Packing and Lubricator Company, The New York, N. Y.—Piston rod packing and lubricators. Represented by E. R. Packer, C. F. Quincy, W. W. Hoit, F. F. Kister, M. M. Case, J. C. Smaltz, S. S. Whitehurst and James Smith. Space 510.

Quickwork Company, The, St. Mary's, Ohio.—Three machines, numbers 20, 30 and 40. "Quickwork" rotary shears. Represented by H. Collier Smith, A. F. Smith, H. Collier Smith, Jr., and Henry Lay. Spaces 116-118.

Racine Tool & Machine Company, Racine, Wis.—"Racine" high speed metal cutting machine; our new improved broaching machine of the milling type. Represented by Fred J. Kidd, E. R. Larson and A. H. Goetz. Space 166.

Railroad Herald, The, Atlanta, Ga.—Copies of the Railroad Herald. Represented by E. C. Laird. Space 763.

Railway Devices Company, St. Louis, Mo.—"Western" angle cock holder; "Perfection" brake ratchet; spiral pipe clamps; "Iron Horse" or pedestal; "Sta-Rite" uncoupling attachments. Represented by Louis A. Hoerr, Roland M. Hoerr, and Sterling Campbell. Space 616.

Railway Materials Co., The, Chicago, Ill.—Brake shoes. Represented by I. B. Lesh, E. C. Folsom and Geo. F. Allen. Space 561.

Railway Purchases and Stores, Chicago, Ill.—Booth with magazines only. Represented by Edward Wray. Space 717.

Railway Review, Chicago, Ill.—Copies of publication. Represented by Willard A. Smith, Harold A. Smith, Arthur E. Hooven, J. E. Gougeon, Charles L. Bates and John M. Lammedee. Spaces 12-14.

Railway Storage Battery Car Company, New York, N. Y.—One operating Edison battery car. Represented by L. Klopman, F. N. Koziell and C. A. Wipf. Space 634 and car on exhibit track.

Ralston Steel Car Company, The, Columbus, Ohio.—Reception booth. Represented by F. E. Symons, J. R. Forney, J. J. Frank, F. S. Clark, B. C. Hanna, C. S. Rea and J. F. Leonard. Space 558.

Reading Iron Company, Reading, Pa.—Genuine wrought iron pipe; charcoal iron boiler tubes; cut nails (black and galvanized.) Represented by L. E. Thomas, W. W. Williams, E.

J. Mishler, H. F. Mattern, Craig Geddis, H. S. Carland, A. R. Kinsler and Agnew T. Dice, Jr. Space 222.

Reading Specialties Company, Reading, Pa.—Car and engine replacers; car shocks; derails. Represented by M. G. Moore, J. J. O'Connell, W. J. Zimmerman and D. H. Fowler. Space 612.

Republic Iron & Steel Company, Youngstown, Ohio.—Reception booth. Space 517.

Rhodes Manufacturing Company, The, Hartford, Conn.—Rhodes shapers and slotters. Represented by Joseph H. Hazley and G. Albert Englund. Space 132.

Rice Manufacturing Company, Indianapolis, Ind.—Red Devil rivet cutters. Represented by A. G. Rice and H. A. Mansfield. Space 741.

Rich Tool Company, Chicago, Ill.—High speed twist drills; high speed structural reamers; rivet sets; chucks; high speed milling cutters; tire forming tools and other small tools. Represented by W. B. Sullivan, L. H. Whiteside, C. R. Canfield and C. M. Conner. Spaces 726-728.

Rivet Cutting Gun Company, Cincinnati, Ohio.—Cincinnati rivet cutting guns, slag guns, rivet head catchers and other safety devices. Represented by John M. Crowe and Louis K. DeBus. Space 513.

Roberts Automatic Connector Company, Sarnia, Ont., Canada.—Automatic connectors for train pipe. Represented by J. W. Roberts and William E. Saylor. Space 756.

Robinson Company, The, Boston, Mass.—Robinson exhaust nozzle. Represented by Frederic Parker. Spaces 564-565.

Robinson Connector Company, Inc., The, New York, N. Y.—The Robinson automatic connector. Represented by Herbert W. Brown, A. R. Whaley, Joseph Robinson, James L. Hagar, H. D. Cameron, Joseph A. Cameron and G. E. Matheson. Spaces 318-320-322.

Rogers Company, H. A. New York, N. Y.—Moncrieff Scotch tubular gauge glasses; Scotch reflex gauge glasses and Scotch glass protector plates for gauge glass shields. Represented by Harry S. Griffith. Space 372.

Rome Iron Mills, Inc., New York, N. Y.—Test specimens of staybolt and engine bolt irons. Represented by B. A. Clements and C. C. Osterhout. Spaces 414-416-424-422.

Ryerson & Son, Joseph T., Chicago, Ill.—Ryerson-Conradson lathes, milling machines, radial drills and planers; Ulster special staybolt iron; Ulster engine bolt iron; Ryolite tool steel. Represented by H. T. Bradley, J. H. Craigie, E. W. Kavanagh, I. H. Jones, J. C. Becker, H. A. Gray, C. E. Pynchon, J. B. Barton, J. P. Moses and A. W. Willcuts. Spaces 174-176.

Safety Car Heating and Lighting Company, New York, N. Y.—Electric and gas car lighting equipment; car lighting fixtures and reflectors; electric fans; oxy-Pintsch metal cutting equipment. Represented by W. L. Garland, J. H. Rodger, J. S. Henry, R. H. Harvey, S. I. Hopkins, A. B. Mills, H. D. Donnell, G. E. Scott, C. A. Pinyerd, J. L. Marsh, W. S. Wepf, H. K. Williams, H. W. Davies, A. P. Hagar, G. E. Hulse and L. Schepmoes. Space on platform.

Safety Equipment Service Company, The, Cleveland, Ohio.—Safety goggles, signs, gloves, clothes and leggings; machine guards; respirators; complete safety equipment of all kinds. Represented by Buell W. Nutt. Space 750.

Sargent Company, Chicago, Ill.—Sargent safety three face water gauge; "Ironclad" water glass protector; Sargent safety combination water glass gasket; Renu gauge cock; Security grease plug. Represented by George S. Garren and George H. Sargent. Space 600.

Schaefer Equipment Company, Pittsburgh, Pa.—Schaeffer truck lever connections; brake rod jaws; brake levers; K-C repair card holders and K-C collapsible stake pockets. Represented by F. A. Barbey, H. G. Doran, S. M. Hindman, Frederic Schaefer and E. J. Searles. Space 511.

Scullin Steel Company, St. Louis, Mo.—Freight car truck with pedestal truck side frame arranged for use with all standard makes of M. C. B. journal boxes. Freight car truck with pedestal truck side frame using special journal box. Represented by Frank L. Norton, G. L. L. Davis, E. S. Wortham and H. E. Doerr. Spaces 301-303.

Sellers & Company, Wm., Inc., Philadelphia, Pa.—Locomotive injectors; valves; new devices; dirfting valves; injector indicator. Represented by S. L. Kneass, Chas. T. Wilson, James R. New, John D. McClintock and E. L. Holljes. Spaces 625.

Simmons-Boardman Publishing Company, New York, N. Y.—Various papers and books devoted to shipping by land and water. The Railway Age, the Railway Mechanical Engineer, the Railway Signal Engineer, the Railway Maintenance Engineer, the Railway Electrical Engineer, Car Builders Dictionary, Locomotive Dictionary, Shipbuilding Cyclopedia, Marine Engineering, and the Boiler Maker. Represented by S. O. Dunn, R. V. Wright, A. H. Steubing, R. E. Thayer, C. B. Peck, C. N. Winter, A. G. Oehler, E. L. Woodward, L. G. Plant, C. J. Corse, C. W. Foss, F. W. Kraeger, A. Ortlinghaus, E. Rehm, L. B. Sherman, Henry Lee, F. C. Koch, H. H. Marsh, R. H. Smith, F. H. Thompson, F. S. Dinsmore, C. R. Mills, J. E. Anderson, J. M. Rutherford, H. L. Burrhus, J. P. Risque, A. R. Jarvis, F. H. Behrens, G. W. Armstrong, F. W. Hoadley, P. Traeger, E. C. Jackson, H. Foster, George Slate, R. F. Duysters and W. E. Kennedy. Space 1.

Simmons Hardware Company, St. Louis, Mo.—Welded ware; shovels; scoops; handles; tools. Represented by J. B. Webb, H. W. Jacques and S. O. Paull. Space 380.

Simonds Manufacturing Company, Fitchburg, Mass.—Circular metal cutting saws, both solid and inserted tooth, demonstrated in operation. Files and hack saw blades. Represented by H. B. McDonald, S. Patterson and B. F. Kelly. Space 308.

Smith Locomotive Adjustable Hub Plate Company, Chicago, Ill.—Model of two locomotive driving wheels mounted on axle showing adjustable hub plate application in detail. Represented by A. J. Sams. Spaces 602-604-606.

Soderling, Walter, Inc., New York, N. Y.—Respirators, gas masks, ammonia masks; dust hoods; sand blast helmets; chipping masks; babbitting masks; acid hoods; bag house helmet; goggles. Represented by Walter Soderling, F. M. Rockwell, J. F. Copeland and H. Devitt Welch. Space 753.

Southern Economy Device Company, Shreveport, La.—Removal driving box and adjustable lateral plate. Represented by H. B. Furstonburg and D. R. McFarland. Space 336.

Southern Valve Company, Knoxville, Tenn.—Model of Southern valve gear. Represented by H. A. Kibby. Space 809.

Southwark Foundry & Machine Company, Philadelphia, Pa.—Universal flue cutter; Lewis flue cutter; Gray's turret rotary shear; Mason washer making press; model of hydraulic spring banding press. Represented by W. H. Harman, F. G. Schranz, E. L. Garihan, G. Harry Case, T. M. Platt and C. B. Gray. Space 179.

Speedograph Corporation, Newark, N. J.—Speed, time and distance recording instruments for road engines and switch engines. Represented by Horace H. Smith and A. F. Wallbillich. Space 747.

Standard Brake Shoe & Foundry Company, Pine Bluff, Ark.—Locomotive driver and car brake shoes; represented by F. L. Dilley and S. F. Dilley. Space 13.

Standard Car Truck Company, Chicago, Ill.—Complete models showing different types and capacity of lateral motion trucks and working parts; roller center plates; roller side bearings and four-point bearing truck. Represented by Lee W. Barber, James T. Milner and F. L. Barber. Space 514.

Standard Coupler Company, New York, N. Y.—Sessions-Standard friction draft gears. Represented by Geo. A. Post, E. H. Walker, A. P. Dennis, Geo. A. Post, Jr., R. G. Gallagher, Jr. and Wilbur Eckels. Space 500.

Standard Forgings Company, Chicago, Ill.—Forged steel "Stanforge" draft rigging, driving axle, truck axle, piston rod, crank pin, center plate and journal wedge. Represented by E. W. Richey, C. R. Lewis, O. L. De Lano, C. R. Jernberg and M. A. Metzger. Space 537.

Standard Railway Equipment Company, Chicago, Ill.—Murphy solidsteel roof; Murphy XLA flexible roof; Ideal and Z. U. carlines; Murphy corrugated steel end; Ajax corrugated steel

hopper door; Carmer release rigging; Imperial type "B" release rigging; Imperial centering device; National side door fixtures and National corrugated steel side door. Represented by W. P. Murphy, A. A. Frank, S. G. Rea, Geo. T. Cooke, A. C. Murphy, G. G. Gilpin, A. G. Bancroft, V. E. Sisson, J. T. Cralley, W. L. Jefferies, Jr., S. M. Hindman, S. Worcester Sargent, C. G. Elliott, Geo. T. Cook and Frank Bergen. Spaces 426-428.

Standard Stoker Company, Inc., New York, N. Y.—duPont type mechanical stoker for locomotives. Represented by Alexis duPont, H. L. Walker, F. H. Cunningham, J. A. Carey, F. P. Roesch and J. E. Smith. Space 4 in main building and 338 in exhibition hall.

Standard Tank Car Company, Sharon, Pa.—One tank car on the exhibit track. Represented by G. F. Woodsmith, W. H. McCartney and M. F. Covert.

Stone Franklin Company, New York, N. Y.—Complete single battery axle generator equipment; complete double battery axle generator equipment. Represented by R. G. Coburn, C. E. Walker, H. D. Rohman, J. L. Hays and W. L. Gray. Space 406.

Stucki Company, A., Pittsburgh, Pa.—Side bearings. Represented by A. Stucki and A. B. Severn. Space 731.

Sunbeam Electric Manufacturing Company, Evansville, Ind.—Type RE-3, 500 watt, 32 volt locomotive headlight turbo-generator; pattern 1018 headlight; pattern 1412 headlight; pattern 1414 headlight; an assortment of reflectors, both glass and copper silver plated; also various accessories such as lamp stands, dimming devices. W. A. Carson, F. W. Edmunds, H. A. Varney, J. Henry Schroeder, L. B. Jones, W. T. Manogue and A. J. Leonard. Spaces 321-323.

Swanson Automatic Flange Lubricator Company, Denver, Colo.—Flange lubricator; air end pump lubricator; air pump piston swab nut lock. Represented by O. W. Swanson. Space 336.

Swind Machinery Company, Philadelphia, Pa.—One No. 314 Baker drill; 21 inch Fosdick upright drill; Gray sheet metal cutter; 13 inch Willard geared head lathe. Represented by L. H. Swind, J. E. Brandt, W. J. Powers, R. W. Burk and C. H. Ott, Jr. Spaces 156-158.

Symington Company, The T. H., New York, N. Y.—Full size models Farlow draft gear attachments; Symington journal boxes; Symington journal box lid with locking attachment. Represented by C. J. Symington, J. F. Schurch, T. C. deRosset, R. H. Gwaltney, A. H. Weston, I. O. Wright, Horace White, C. R. Naylor, Hynes Sparks and J. C. Barr. Spaces 568-569.

Tacony Steel Company, Philadelphia, Pa.—Reception booth. Represented by J. B. Warren and T. Burd Zell. Space 608.

Talmage Manufacturing Company, Cleveland, Ohio.—Automatic connector; a device for distributing lubricating oil; rachet hand brake; low water alarm; drifting valve. Represented by J. G. Talmage, F. M. Roby and A. F. Leatherer. Spaces 354-355-356-357.

Terwilliger Equipment Company, Philadelphia, Pa.—Detroit square and hexagon drills. Represented by M. J. Conboy. Space 336.

Transportation Engineering Corporation, New York, N. Y.—Electric storage battery trucks and tractors for freight stations, piers, shops and storehouses. Trailers, for use with electric tractors or for hand operation; charging apparatus; switchboards; Wanamaker coated electrodes for electric arc welding; welding wire for electric and gas welding; welding accessories; electrode holders; face shields; masks; water stills. Represented by H. G. Thompson, F. V. McGinness, H. H. Smith, K. R. Hare, H. W. Stortz and W. F. Gunn. Space 614.

Trumbull Waste Manufacturing Company, Philadelphia, Pa.—Jaumave tampico fiber. Various grades of journal box packing prepared with curled Tampico fiber as a substitute for wool waste. Represented by Raymond R. Bilter and W. P. Carroll. Space 757.

Tuco Products Corporation, New York, N. Y.—Tucolith plastic composition flooring material; flexolith composition flooring material; steel preservative as applied to chanarch; Imperial and Universal car window screens; National and Universal steel trap doors; trap door locks; resisto quilt hairfelt insulation; Tucork mineral insulation. Represented by D. W. Pye, W. J. Elliott, F. N. Grigg, J. W. Coleman, M. A. Whalen and F. A. Barbey. Space F.

Underwood Corpn., H. B., Philadelphia, Pa.—Locomotive cylinder boring, bar with contracted drive; one with regular spur gear drive; one circular planer tool; one heavy type rotary valve seat planer; one dome facing machine; crank pin turning machine attached to work; new type steam engine; hand pipe bending machine. Represented by G. A. Graham and W. Weidemann. Spaces 379-381.

Union Connector Company, St. Louis, Mo.—Union automatic train-line connectors. Represented by C. A. Alexander, L. D. Woodruff and M. H. Martin. Spaces 374-376.

Union Draft Gear Company, Chicago, Ill.—Cardwell friction draft gear, type G, class 11-A; Cardwell friction draft gear, type G, class 11-A; duplex. Represented by J. R. Cardwell, L. T. Canfield, J. W. Hathaway, J. E. Tarelton, W. G. Krauser, C. J. Gorman, H. Barnard, F. E. Schmitz and J. A. King. Spaces 413-415.

Union Railway Equipment Company, Chicago, Ill.—The Ureco reclaim coupler release rigging; improved brine valve; tank hand-hole; drop brake shaft; pipe clamp; tank support; bevel hatchway; metal box-car ladder. Represented by W. B. Hall and A. F. O'Connor. Space 508.

Union Spring & Manufacturing Company, Pittsburgh, Pa.—Reception booth. Represented by L. G. Woods, F. E. Schaeffer, W. R. Blair, A. C. Woods and J. W. Chandler. Space 553.

United Engineering & Foundry Company, Pittsburgh, Pa.—Model forging press. Represented by A. P. Bark and H. D. Kneeland. Space 540.

United States Graphite Company, The, Saginaw, Mich.—Complete line of graphite and graphite products for the steam road trade. Represented by C. M. Williamson, F. B. Godard and C. D. McIntosh. Space 359.

U. S. Light & Heat Corporation, Niagara Falls, N. Y.—USL car lighting devices in operation; arc welder demonstration; car-lighting storage battery; Willys light and power plant with USL battery. Represented by H. A. Matthews, E. J. Blais, E. T. Sawyer, R. R. Desmond, W. L. Bliss, Geo. L. Kyle, Geo. P. Wray, J. F. Geiger, W. A. Turbayne, E. Bauger and O. R. Hildebrand. Spaces 315-317-319.

U. S. Metallic Packing Company, The, Philadelphia, Pa.—King metallic packing; Gollmar bell ringer; Leach track sanders; Indestructible oil cups; Security wrist and knuckle pins. Represented by E. Curtiss, M. B. Brewster, J. T. Luscombe, J. S. Mace, H. E. Hyslop, R. R. Wells and L. B. Miller. Spaces 566-567.

United States Rubber Company, New York, N. Y.—Rubber hose, packings, pump valves, axle dynamo belts, hard rubber products, friction tape and splicing compound. Represented by J. F. Tracy, W. B. Mallette, Marvin Stoddard, W. G. Lindsey, J. C. Lockhart, R. G. Kennedy, E. Hubert, W. C. Chambers, A. B. Means, G. W. Haynes, L. S. Hungerford, Jr., J. F. McDonnell, W. B. Wise and C. S. Prosser. Space 7.

Universal Car & Hose Coupler Company, Louisville, Ky.—Automatic car and hose coupling device. Represented by J. H. Funk and J. A. Houle. Space 36.

Universal Draft Gear Attachment Company, Chicago, Ill.—Cast steel coupler yokes; cast steel reinforcing draft arms; miscellaneous draft lugs in cast steel and malleable iron. Represented by C. J. Nash, C. C. Kinsman and H. I. Wrigley. Space 515.

Vanadium Alloys Steel Company, Pittsburgh, Pa.—High speed, carbon and alloy tool steels; ferro tungsten. Represented by W. I. Crocker and John Theis. Space 360.

Van Dorn Girder Plate Company, Chicago, Ill.—Models showing applications of Van Dorn corrugated steel ends to freight cars; models of Van Dorn ventilating floorings for refrigerator

cars. Represented by H. E. Van Dorn, Wm. E. Van Dorn, Walter H. Evans and Harold S. Brooks. Spaces 706-708.

Vapor Car Heating Company, Inc., Chicago, Ill.—The Vapor system of car heating—short-circuit cut-out method; new type steam hose couplers, with take-up lock; automatic car temperature control and automatic control for reducing yard temperatures; pressure reducing valves; steam traps; train pipe valves. Represented by Egbert H. Gold, J. E. Buker, S. Higgins, Frank F. Coggin, R. P. Cooley, W. L. Garland, L. B. Rhodes, N. F. Burns, Frank A. Purdy, C. E. Lowell, E. A. Russell, P. B. Parks, E. E. Smith and Wm. Damm. Spaces 208-210-212-214-216.

Victor Tool Company, Inc., Waynesboro, Pa.—Victor nut facing machine; self opening die heads; collapsible taps; universal patternmakers' vises; floating reamer holders. Represented by R. G. Mumma, V. R. Koontz and E. E. Smith. Space 219.

Vissering & Company, Inc., Harry, Chicago, Ill.—Viloco lead lined sanders; Leach type sanders; Viloco (Improved Gollmer) bell ringers; Crescent metallic packing. Represented by Harry Vissering, Chas. R. Long, Jr., G. S. Turner, W. H. Heckman and J. M. Monroe. Space 576.

Walworth Manufacturing Company, Boston, Mass.—Cast and malleable iron fittings; brass and iron body valves; large model of genuine Walworth Stillson wrench, Walworth Bostong; Walco adjustable hex wrench and Walworth Parmelee wrench; also various sizes of these wrenches. Various pipe tools including dies and pipe cutters; Kewanee unions and Kewanee specialties; also model of Walworth Stillson wrench enclosed in case and covered with radium compound so that such wrench is luminous in the dark. Represented by L. F. Hamilton, H. S. Patterson, H. T. Goodwin, F. J. Kelly and G. E. Beves. Space 412.

Ward's Sons Company, Edgar T., Boston, Mass.—Tool steel; steel tubing; steel wires; cold rolled steel; tempered strip steel. Represented by H. L. Edgcomb, W. T. James, W. H. LeMassena and G. Robert Osgood. Space E.

Warner & Swasey Company, The, Cleveland, Ohio.—One No. 2A universal hollow hexagon turret lathe making taper studs; one No. 3A of same design making gear blanks. Represented by L. K. Berry, E. R. Gardner, W. E. Marshall and H. E. Witham. Spaces 143-145.

West Disinfecting Company, New York, N. Y.—Regular standard devices for disinfecting, fumigating and sanitary purposes. Represented by H. E. Daniels, Everett Daniels, W. L. Larry and C. P. Williams. Space 26.

Western Railway Equipment Company, St. Louis, Mo.—Linstrom locomotive syphon; Security dust guards; journal bearing wedges; Western brake jaws. Represented by Louis A. Hoerr, Sterling Campbell and Roland M. Hoerr. Space 616.

Western Steel Car & Foundry Company. See Pressed Steel Car Company. Spaces 545-601.

Westinghouse Air Brake Company, Pittsburgh, Pa.—Universal passenger equipment demonstration rack of three cars and locomotive. Illuminated electric chart showing performance of UC passenger equipment with and without the electro pneumatic feature. Empty and load brake equipment demonstration rack. Westinghouse NA-1 friction draft gear complete; also a used gear taken out of service for test purposes after 25,000 miles' service on a large locomotive tender. Represented by A. L. Humphrey, W. S. Bartholomew, G. W. Wildin, C. C. Farmer, H. F. Woernley, E. A. Craig, J. B. Wright, F. H. Parke, R. W. Williams, C. R. Ellicott, F. H. Whitney, C. H. Beck, T. L. Burton, F. M. Nellis, C. J. Olmstead, A. K. Hohmyer, J. S. Y. Fralich, H. S. Clark, C. P. Cass, H. A. Wahlert, Robt. Burgess and T. W. Newburn. Spaces 23 to 29 and 134 to 144.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.—Type 815 switch; type 809 reversing switch; type C controller class C-7440; types 815 and 816 switch; type A auto starter; type 816 switch; 500 watt 32 volt turbine generator; type F. B. controller; type S duplex controller; type HK crane motor; 175 arc welding outfit. Represented by W. H. Patterson, C. M. Harris, R. L. McLellan, C. C. Bawden, M. Clegg, R. F. Moon, R. J. Ross, E. M. Wise, D. R. Weidon, W. R. Stinemetz, C. W. Babcock, H. C. Mode, A. M. Jones, I. S. Forde, F. W. Carter, H. W. Beaumont, H. K. Smith, F. E. Wynne and C. C. Whitaker. Space 136, and reception booths 23-25-27-29.

Westinghouse Church Kerr Company, New York, N. Y.—Reception booth. Represented by H. H. Kerr. Spaces 23, 25, 27, 29.

Wheel Truing Brake Shoe Co., Detroit, Mich.—Samples of abrasive brake shoes. Represented by J. M. Griffin and F. F. Griffin. Space 507.

White American Locomotive Sander Company, Inc., Roanoke, Va.—Graham-White perfect sanders shown and demonstrated. Represented by John E. Graham, James Frantz and W. L. Rauson. Space 205.

Whiting Foundry Equipment Company, Harvey, Ill.—Working model of Whiting screw-jack locomotive hoist for wheeling and unwheeling locomotives; folios of drawings, photographs and literature covering our complete line of cranes, foundry equipment and railway specialties, locomotive and coach hoists, turntable tractors and transfer tables. Represented by R. H. Bourne, N. S. Lawrence, R. S. Hammond and G. W. Ristine, Jr. Space 178.

Whitman and Barnes Manufacturing Company, The, Akron, Ohio.—Twist drills and reamers. Represented by R. S. Carter, R. A. Ammon, H. E. Fisher, M. J. Kearins, George Hine, H. B. Garske and K. J. Grant. Space 204.

Willard Storage Battery Company, Cleveland, Ohio.—Two sectional cells TF-13 battery combination paste and plante type; one two-cell crate showing section TB-25 paste and TR-13 plante in hard rubber jars; one two-cell crate without paint or linings; miscellaneous parts. Represented by Louis Sears and E. L. Myers. Space 730.

Wilmarth & Morman Company, Grand Rapids, Mich.—Number 1 and number 0 universal cutter and reamer grinder; number 78 surface grinder; number 1 surface grinder; type "B" Pt. and type "WFL" new yankee drill grinder; type "D" Pt. electric drive; type "WPNJ" drill grinder. Represented by Walter E. Heibel, Charles Meech and Lloyd M. Manley. Space 185.

Wilson-Imperial Company, Newark, N. J.—Passenger coach cleaning—exterior and interior. Imperial car cleaners and renovators for all purposes. Represented by J. MacNaull Wilson, D. J. Giles and Frank Sherritt. Spaces 202-204.

Wilson Welder & Metals Company, Brooklyn, N. Y.—Plastic arc welding materials. Represented by J. O. Smith, C. Hartford, P. H. Miller and S. A. Douglass. Spaces 224-226.

Wine Railway Appliance Company, The, Toledo, Ohio.—Wine side bearing, fruit car ventilators and hopper door device. Represented by W. E. Wine, R. F. Tillman, Cyrus J. Holland and W. F. Cremean. Space 630.

Woods & Company, Edwin S., Chicago, Ill.—One flat ball center plate; tip roller side bearing, U. S. R. A. standard, for cars, engines and locomotive tanks; 1 single roller Woods side bearing; 1 Woods "XL" side bearing; several models of side bearings. Represented by Albert G. Welch, William B. Ross, E. G. Jackson and H. M. Perry. Space 617.

Worthington Pump & Machinery Corpn., New York, N. Y.—Locomotive feed water heater; stationary power plant open feed water heater; feather locomotive snifting valve; 2 R oil engine and enclosed pump; Glendora model 3 plunger deep well pump; steam pump. Represented by Thos. C. McBride, H. E. Troutman, Paul B. Fenlon, Thos. C. Cruthers and F. Goodman. Space 133.

Wyoming Shovel Works, The, Wyoming, Pa.—Red edge locomotive scoops. Represented by H. T. Potter, W. C. Wright and E. L. Ruby. Space 211.

Yale & Towne Manufacturing Company, Stamford, Conn.—Hoisting equipment; locks for railroad purposes; overhead trolley; industrial trucks. Represented by C. W. Beaver, H. R. Butler, H. A. White, W. C. Bigelow and L. Kregner. Spaces 148-150.

Yarnall Paint Company, Philadelphia, Pa.—Steel panels showing railroad paints. Represented by L. P. Pratt, G. C. Fisher and V. G. Avery. Space 19.

Youngstown Steel Car Company, Youngstown, Ohio.—Reception booth. Spaces 740-742.

Zapon Leather Cloth Company, New York, N. Y.—Zapon leather cloth (artificial leather). Represented by W. M. Lalor and M. J. Dowling. Space 709.

L. R. Sillcox Promoted

H. R. WARNOCK, general superintendent motive power of the Chicago, Milwaukee & St. Paul, has given notice, under date of June 1, that L. R. Sillcox has been appointed assistant general superintendent of motive power, with headquarters at Chicago.

Chicago Train in Two Sections

THE PENNSYLVANIA special train from Chicago was divided into two sections of nine cars each. The first section left at 3 o'clock Monday afternoon and the second section a few minutes later. Both trains were well filled with convention people.

The Pennsylvania management evidently wanted to show its railway friends how to run a special train, for they gave the passengers on the first section a fast and smooth run and arrived in Atlantic City in twenty-two and a half hours, one hour and forty minutes ahead of the scheduled time. The second section rolled into the station here shortly afterwards, also ahead of the schedule.

John Scullin Passes Away

IT IS WITH THE PROFOUNDEST REGRET that we learn of the death of John Scullin of St. Louis, who passed away there on May 28.

Mr. Scullin's name is intimately associated with the history of the great west. A pioneer in the broadest meaning of that word, he was prominently identified with the construction and development of many steam roads, as well as building and controlling for a number of years the street railways of St. Louis.

At the time of his death Mr. Scullin was chairman of the board of directors of the Scullin Steel Company of St. Louis.

R. S. M. A. Annual Meeting

THE annual meeting of the Railway Supply Manufacturers' Association will be held in convention hall on the pier at 12 o'clock Saturday. District meetings for the election of executive committee members will be held Saturday morning from 10.30 to 11.30 o'clock. For the purpose of canvassing the situation and naming a ticket for officers for the coming year President Carr has appointed the following nominating committee: Samuel G. Allen, Chairman; B. A. Hegeman, Jr., A. L. Humphrey, J. Will Johnson, A. C. Ashton, Harry W. Frost and Scott H. Blewitt, all past presidents of the Railway Supplymens Manufacturers' Association with the exception of Messrs. Humphrey and Ashton.

Yale & Towne Expansion

THE YALE & TOWNE MANUFACTURING COMPANY, Stamford, Conn., announces the purchase of the industrial electric truck division of the C. W. Hunt Company, Staten Island. Hunt trucks are manufactured in several types and have been in use for years in railroad terminals, steamship piers, warehouses and manufacturing plants. The entire trucking equipment of the Panama Canal consists of Hunt trucks. This business will be combined with the Yale & Towne hoist department thus making it possible to furnish the complete equipment for moving medium and light loads either vertically or horizontally.

The Yale & Towne Manufacturing Company is also the exclusive selling agent for Brownhoist trolleys which, used on overhead rails, provide for the horizontal movement of loads between fixed points. Arrangements have been completed to manufacture the Hunt line of trucks at Stamford.

$125,000,000 For Rolling Stock

IMMEDIATE appropriation of $125,000,000 of government funds for the use of railroads to purchase new rolling stock was announced to-day by the Interstate Commerce Commission. The money will be advanced out of the $300,000,000 revolving fund provided in the Transportation act.

Appropriations for additions and betterments to promote the movement of cars were fixed at $73,000,000; to meet maturing obligations at $50,000,000, and for loans to carriers at $12,000,000. Of the total to be advanced for rolling stock $75,000,000 will be set aside for the purchase of freight cars, with preference given to 20,000 refrigerator cars to move fruit crops, and $50,000,000 for the acquisition of locomotives, with preference given to freight and switching locomotives.

In each case first allotments will be made to roads making the greatest advances to meet the government loans, In the case of the advance for locomotives applicants will be required to contribute at least 50 per cent of the costs, but before any passenger locomotives are purchased attention will be given to the need for freight and switching engines by roads which are unable to make 50 per cent advances.

Roads applying for loans for equipment and betterments also will be required to make such contributions "as it is within their power to furnish."

The commission will not recommend loans out of the $50,000,000 fund for retiring maturing obligations unless the applicants have clearly exhausted every effort to take care of maturities "by extension, by refunding and by every other means."

Time for filing applications and amendments was extended to June 19th and the Association of Railway Executives, which proposed the division of the $300,000,000 revolving fund approved by the commission, was urged to submit its recommendations so that the general distribution of the funds might begin not later than June 26th .

Registration, American Railway Association, Sec. III, Mechanical

Alleman, C. W., G. S. K., P. & L. E., Elberon.
Anderson, R. W., Asst. S. M. P., C. M. & St. P., Marlborough.
Averill, E. A., C. O., Loco. Feed Water Htr. Co., Ambassador.
Barry, F. J., M. M., N. Y. O. & W., Chalfonte.
Beattie, J. A., G. S., McKeesport Connecting, Dennis.
Bell, J. Snowden, Affiliated, Wiltshire.
Bentley, H. T., S. M. P., C. & N. W., Marlborough.
Blake, R. P., M. M., N. P., Esplanada.
Bohan, W. J., Asst. M. S., N. P., Marlborough.
Bowersox, C., M. M., T. & O. Cent., Chalfonte.
Brazier, F. W., A. to G. S. M. P., N. Y. C., Marlborough.
Brewster, E. J., G. F., C. & N. W.
Burns, John, Works Mgr., C. P., Ambassador.
Callison, W. A., S. M. P., C. I. & L., Haddon Hall.
Cantley, Wm. I., M. E., Lehigh, Dennis.
Carson, F. L., M. Supt., S. A. & A. P., Sterling.
Collett, Robert, S. F. & L. P., N. Y. C., Strand.
Cook, Adam, Gen. Car Frman., N. P.
Cooper, F. E., M. M., B. & O., Traymore.
Cooper, F R., M. M., Gold Car Htg. & Ltg. Co., Dennis.
Cory, Chas. H., C. H. & D., Dennis.
Crawford, D. F., Loco. Stoker Co., Brighton.
Crone, S. A., Buffalo Brake Beam Co., Dennis.
Crosby, R. M., Genl. M. M., N. P., Esplanade.

Curry, H. M., M. S., N. P., Marlborough.
Cutler, T. J., Gen. M. M., N. P., Esplanade.
Davey, T. S., S. St., Erie, Pennhurst.
Davis, J. E., M. M., H. V., Chelsea.
Davis, W. P., M. M., N. Y. C., Haddon Hall.
DeWolff, F. A., Interntl. Ry. Supply Co., Chelsea.
Dooley, W. H., S. M. P., C. N. O. & T. P., Dennis.
Dukerley, W. E., M. M., N. P., Esplanade.
Egbers, G. F., M. M., N. P.
Eich, H. C., G. S. M., C. G. W., Chalfonte.
Embury, W. B., M. M., Rock Island Line.
Endsley, L. E., Prof., University of Pittsburgh, Chalfonte.
Farr, B. J., S. M. P & Car. Dept., G. T. & W., Marlborough.
Fitzgerald, W. T., M. M., Erie, Bothwell.
Flory, B. F., S. M. P., N. Y., Ont. & West., Marlborough.
Flynn, W. H., S. M. P., Mich. Central, Marlborough.
Foque, T. A., G. M. D., M. St. P. & Ste. Marie, Traymore.
Fox, H. K., M. E., C. M. & St. P., Traymore.
Fuller, C. N., S. M. P. & R., U. P., Marlborough.
Gaines, F. F., Bd. No. 3, U. S. R. A., Marlborough.
Giles, C. F., S. M., L. & N., Chalfonte.
Goodnow, T. H., S. C. D., C. & N. W., Marlborough.
Goodwin, Geo. S., M. E., C. R. I. & O., Chalfonte.
Greaven, Louis, S. M. D., Ferro Carril Del. Sed., Breakers.
Griffin, H. G., Gen. Supt., Morris & Co., Traymore.
Griffith, W. G., M. M., Marlborough.
Grimm, E. L., M. E., N. P. Ry.
Haig, M. H., M. E., A. T. & S. F., Chelsea.
Hartman, W. J., Air Brake Inspr., Rock Island Lines, Pennhurst.
Hawthorne, V. R., Secy. Sec. III, Mech., Amer. R. R,, Marlborough.
Higgins, C. C., S. M. P., St. L. & S. F., Traymore.
Hogan, C. H., A .S. M. P., N. Y. C., Marlborough.
Hussey, F. A., M. M., B. & A., Pennhurst.
Huston, F. T., M. M., Penn., Chelsea.
Kellogg, D. P., S. M. P. & M., Los Ang. & S. L., Chalfonte.
Kerwin, J. M., M. M., C. R. I. & P., Strand.
Kinney, M. A., S. M. P., H. V., Traymore.
Kinney, W. H., M. M., N. Y. O. & W. R. R. Co., Strand.
Kirkman, W. B,, Pres.. Cropley Phillips Co., Haddon Hall.
Kuhn, B. F., Asst. S. M. P., N. Y. C., Marlborough.
La Mar, A., M. M., Penna. Lines, Dennis.
Laughlin, Geo. F., S. C. D., Fruit Growers Express, Marlborough.
Lewis, W. H., Marlborough.
Linstrom, C. A., Ch. Eng., P. A. & Mck., Shelburne.
Littlehales, D. S., M. M., N. P., Esplanade.
McCoff, J. H., M. S., A. T. & S. F.
McDonnell, F. B., M. M., Penn. System, Chelsea.
McPherson, T. J., M. M., Green Bay & Western, Princess.
McQuillen, J E., M. S., Gulf Colo. & Santa Fe, Esplanade.
Mechling, J. E., S. M. P., Penn. System, Craig Hall.
Meloy, H. C., Supt. Elect. Apply, N. Y. C., Dennis.
Milton, J. H., S. C. D., C. R. I. & P., Chalfonte.
Moore, B. R., S. M. P., D. & I. R., Traymore.
Moore, Wm., M. M., Erie R. R., Alamac.
Morehead, L. B., M. E., C. I. & L., Traymore.
Moses, F. K., M. M., B. & O. Chgo Term.
Mulreney, John, M. M., Detroit & Mac. R. R., Princess.
Murray, F. H., Shop Supt., Erie, Susquehanna, Alamac.
Murray, G. E., Elec. & Mech. Engr., Grand Trunk Western Lines, Marlborough.
Nash, J. H., S. M. P., I. C., Chalfonte.
Neesley, F. P., M. M., I. C. R. R., St. Charles.
Neish, J. B., M. M., N. P., Esplanade.
Nelson, M. M., G. F., N. P., Esplanade.
New, W. E., M. M., K. C. Terminal R. R.
Norton, C. H., M. M., Erie, Pennhurst.
Olsen, W., S. of P. P., N. Y. C., Haddon Hall.
O'Neil, W. J., M. M., C. R. I. & R., Breakers.
Osmer, J. E., S. M. P. & C. D., Ann Arbor, Chalfonte.
Parks, G. E., M. E., M. C., Brighton.
Parsons, C. F., M. M., Mch. Div. N. Y. C., Marlborough.
Peck, C. E., A. S. M. P., Oregon, Washington R. R. & Nav. Co., Chalfonte.
Porth, H. W. L., M. C. B., Swift & Co., Traymore.
Pownall, W. A., M. Eng., Wabash Railway, Traymore.
Pratt, E. W., Marlborough.
Prendergast, A P., S. M., Tex. & Pac., Marlborough.
Preston, Robert, Asst. S. M. P., C. P., Haddon Hall.
Purcell, John, Asst. to V. P., A. T. & S. F., Marlborough.
Rae, Clark H., Asst. Supt. Machy, L. & N., Shelburne.
Ream, A. H., S. M. P., P. & S., Arlington.

Special Guests

Arn, J. G., L. & N., Chalfonte.
Blackburn, H. E., Supervisor Apprentices, Erie, Clifton.
Brehenfeld, J. C., Supt. of Shops, St. L. & S. F., Princess.
Gorman, John C., Supt., McK. Con., Galen Hall.
Davey, I. J., Gen. Boiler Insp., N. P., Esplanade.
Davis, Jas. P., Gen. Ext. Agt., McKeesport Connecting Rd., Galen Hall.
Drake, W. A., Manager, Penn Tank Line, Traymore.
Fatzinger, Thomas, Erie, Bothwell.
Hair, John, Special Engineer, B. & O., Dennis.
Hill, A. T., G. F. A., Lake Terminal, Galen Hall.
Horan, F. T., Asst. Supt., Lake Terminal, Galen Hall.
Hughen, J. M., M. C. B., Penna. Tank Line, Traymore.
Kitchcock, W. D., M. M., A. T. & S. F., Ambassador.
Jordan, Paul W., W. B. Kirkman, Haddon Hall.
McDowell, J. L., General Car Foreman, K. and I. Terminal, Orborn.
McLaughlin, D. J., Traymore.
Montgomery, H. B., Traymore.
Myers, R. B., Traymore.
Owens, R. H., M. C. B., Cosden & Co., Strand.
Pullar, John, M. M., A. T. & S. F., Ambassador.
Reisse, J. H., Ch. Draft., C. B. & Q., Marlborough.
Ritz, Austin L., Traymore.
Ross, W. C., M. M., Copper Range, Strand.
Russell, H. L., Draft. M. P. Dept., W. & L. E., Shelburne.
Stevens, F. J., M. M., Atlantic & Shore R. R. Co., Haliburton Apt.
Strous, C. E., M. M., L. & W. B., Brighton.
Thomas, F. W., Supt. Apprentices, Sante Fe, Chalfonte.
Tutt, T. I., V. P., Penn. Tank Line, Traymore.
Vought, Harry D., Secy., New York Ry. Club, Marlborough.
Wiberg, R. L., Asst. Gen. Foreman, B. & A., Pennhurst.

Conventionalities

Mr. and Mrs. George R. Carr arrived in Atlantic City several days before the conventions opened. They are at the Marlborough-Blenheim. Their early arrival was necessitated by Mr. Carr's many duties and responsibilities as president of the Railway Supply Manufacturers' Association. This is Mrs. Carr's first appearance at these conventions and her presence has already been appreciated. Mr. Carr has missed but one of these conventions since 1906. That was the convention in 1913 when Mr. and Mrs. Carr were married in San Francisco. That year surely must have been the year in which the expression originated. "Two is company, three is a convention." It may be added that Mr. and Mrs. Carr have just moved into their new home at Lake Forest, Illinois, and that during their absence their two daughters, Katherine and Martha, are taking good care of the flowers and the natural beauties of the place.

It is to be regretted that W. T. Tyler, vice-president of the Northern Pacific and former director of operation of the Railroad Administration will not be able to attend the convention. Mr. Tyler had arranged to be here but an important inspection trip over the Northern Pacific prevented. Mrs. Tyler and her two nieces, however, will be among the convention visitors.

H. G. Thompson of the R. S. M. A. executive committee certainly is handy with a nail puller and he swings a wicked hammer. Either business must be good or he has missed his calling. A first-class carpenter can call for a comfortable looking envelope on Saturday now-a-days.

William Schlafge, mechanical manager of the Erie, drove down from Ridgewood, N. J., to the Strand Hotel, 170 miles, in five hours and a half Tuesday—and got here without being arrested!

The mechanical departments of the main lines of Cuba are expected to be represented this year in the arrival today of George Knight, superintendent of motive power of the Cuba Railroad at Camaguey, Cuba, and Major Major, who occupies a similar position on the United Railways of Havana. The latter recently succeeded O. R. Hale, who resigned to enter the railway supply business on the island of Cuba.

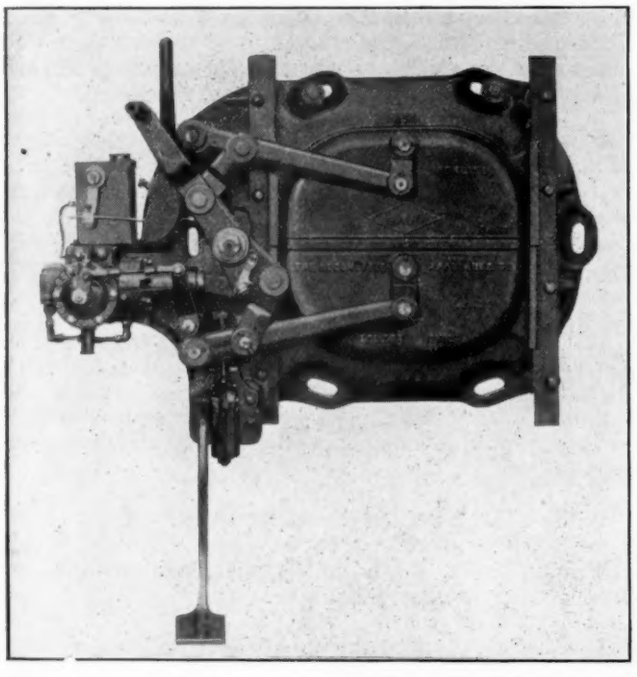
Frank DeWolff, formerly locomotive superintendent of the Cuban Central at Sagua La Grande, Cuba, is here this year in the capacity of special representative of the International Railway Supply Company. Thus has this concern annexed a second star from the field of Latin America, O. R. Hale, well known here as the former superintendent of motive power of the United Railways of Havana, having been the first.

George Green, vice-president of the National Waste Company, is playing a dual role at the convention this year. A short time ago the Universal Packing & Service Company was incorporated and Mr. Green was made president. The other officers are J. P. Landreth, vice-president, and L. Rowe, secretary and treasurer. H. W. Davis, of the Inspection and Test Section of the Railroad Administration, has recently become identified with this company.

New Devices Among the Exhibits

Laco Locomotive Firedoor

ONE OF THE MOST INTERESTING features in connection with a new automatic locomotive firedoor that has been placed on the market by the Locomotive Appliance Company, Toledo, Ohio, is that it may be operated with either steam, air or, if necessary, by hand. The advantages of a firedoor that can be satisfactorily operated by steam in place of air are obvious. In the first place, the economy obtained through utilizing a primary in place of a secondary source of power is considerable. At the most recent convention of the Air Brake Association a report was submitted showing the extent of the loss attributable to the automatic firedoor and other air operated devices. The air required to operate an automatic firedoor is considerable and there are other objections to drawing on this source of power for the operation of all of the ever-increasing number of air operated auxiliary appliances being placed on locomotives.



Laco Steam and Air Operated Firedoor

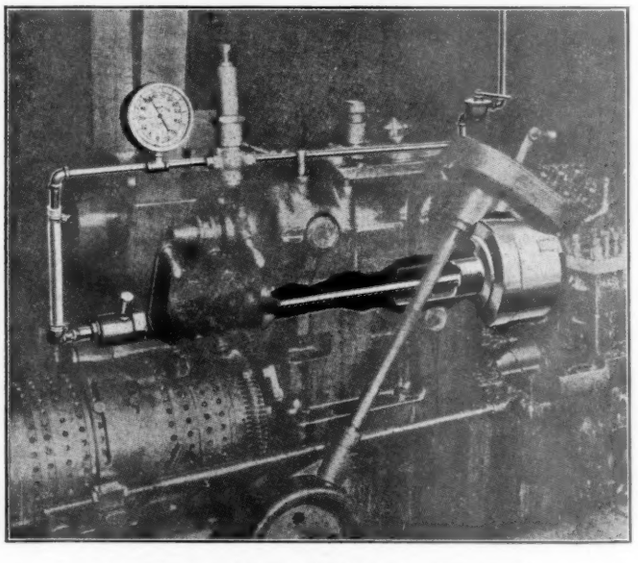
The manner in which this door operates does not differ greatly in other respects from other automatic firedoors. The foot lever is in the customary location and a hand lever is conveniently located at the left hand side of the door. In fact, anyone familiar with the operation of automatic firedoors could operate this door with equal facility. Moreover, the door is standard to all locomotives; that is, the contour ring is a separate piece which can be adjusted to fit any type of door opening.

There is nothing complicated about this device. All working parts are accessible for inspection and the wear of the operating mechanism comes entirely on pins that can be easily renewed when worn. Long wear and smooth operation, however, are insured by a positive type force feed lubricator mounted over the motor. The operation of this motor is controlled by a rotary valve. The door is both pressure opened and pressure closed. Full pressure is exerted to open the door to within one inch of its maximum opening and the cushion of the operating motor slowly completes the stroke. In closing, the customary bang and clatter is eliminated by the cushion in the operating motor which operates as in opening.

The Laco locomotive firedoor is operated by either steam or air below normal operating pressure of the locomotive and this is controlled by a pressure regulator set at 65 lb. The change from steam to air as an operating medium can be made quickly and the door can be operated by hand at any time without difficulty. A safety locking arrangement is provided, by which the door can be locked in any position, eliminating the possibility of the doors sliding shut when a mechanic is at work inside the firebox.

Reconstructed Air Chuck

THE LAVOIE AIR CHUCK as manufactured by the Frontier Chuck & Tool Company, Buffalo, N. Y., was originally designed for shell work during the war and when this class of production was eliminated to a large extent, steps were taken to perfect the chuck for commercial purposes. When first made no particular thought was given to shop criticisms in the way of overhang, movement of the jaw and openings in the face, due to the fact that the grip was held to be most important. Since that time, however, the chuck has had to be reconstructed in order to give sufficient grip to handle general production work and at the same time reduce the overhang to a minimum. Sufficient movement of the jaw to take care of more general variations in castings and forgings and a closed face to prevent dirt from entering the chuck are additional advantages now secured. The new chucks manufactured on these lines

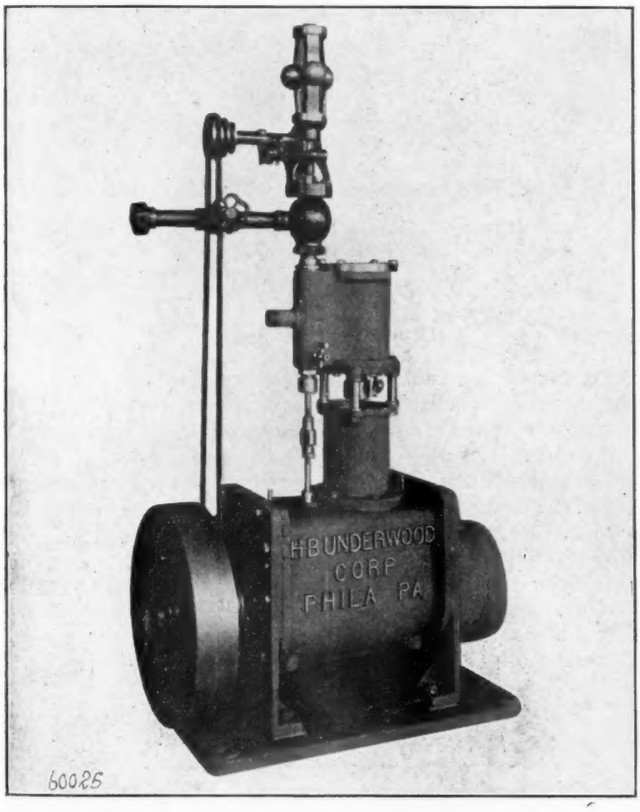


Lavoie Air Chuck Applied to Automatic

have proved, after extensive production tests, that the changes were well worth while. The three-jaw chuck is made in sizes ranging from 10 in. to 24 in. and the two-jaw chuck in sizes ranging from 6 in. to 12 in.

Air or Steam Operated Engine for Portable Tools

THE LATEST ADDITION to the line of portable tools manufactured by H. B. Underwood & Co., Philadelphia, Pa., is a small engine built in three and five horsepower sizes. This engine is designed to drive portable tools, such as boring bars, valve seat rotary planers, drilling machines, etc. It is constructed to use either compressed air or steam. Designed with the idea of securing maximum economy and durability, this engine is intended to equal an air or electric motor for



Underwood Air or Steam Operated Engine

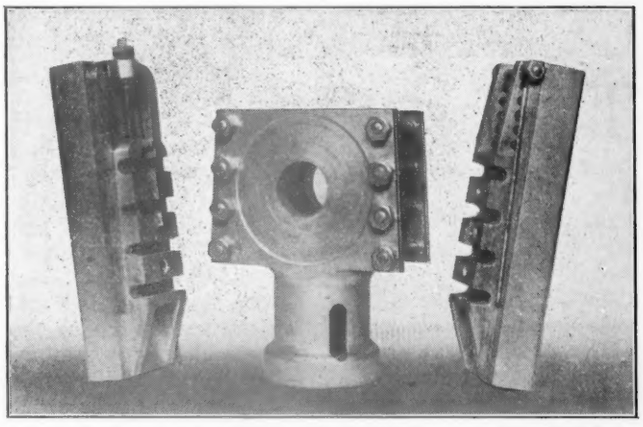
quick work and be more economical, particularly when near a line of steam or compressed air.

All working parts are enclosed in an oil-tight case, which is formed in the base of the engine, making it dustproof and reducing wear to a minimum. The cylinder of the three-horsepower engine is 3½ in. in diameter and the five-horsepower 4 in. in diameter. Both engines have a stroke of 3½ in. The design of the suction valve used reduces friction and wear to a minimum. The crank shaft is a solid steel forging, finished 1½ in. in diameter. The engine is well balanced, using 70 to 125 lb. pressure and runs at a speed of 250 r.p.m. When running at a higher speed there is little tendency to vibrate on account of the careful machine design. The floor space required for this engine is 12 in. by 21 in. and the height from the base to the top of the governor is 46 in.

Rogatchoff Adjustable Crosshead

AN ADJUSTABLE CROSSHEAD for locomotives is being exhibited at the booth of the Metal & Thermit Corporation. The distribution of this crosshead is controlled by the Theodore Rogatchoff Company, of Baltimore, Maryland, and it has given a very creditable performance in test on one of the larger Eastern railroads.

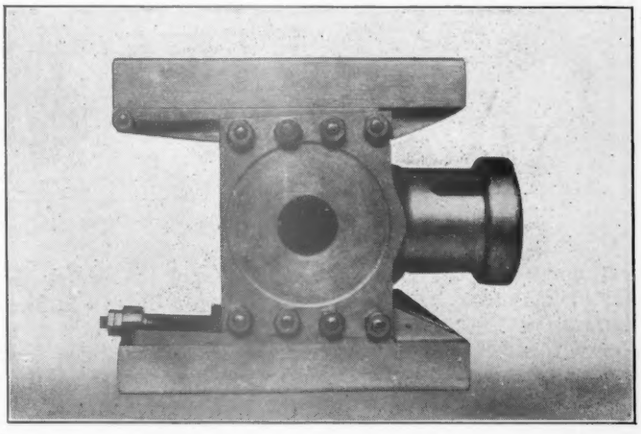
The crosshead consists of several parts, the shoes being detachable and provided with adjustable wedges by means of which the wear on the crosshead shoes may be



Details of the Rogatchoff Adjustable Crosshead

taken up and the crosshead kept in proper contact with the guides. The crosshead itself has the two sides spaced apart, as shown in the illustrations, with the inner face of each side beveled inwardly to receive a corresponding beveled projection on the crosshead shoes. The shoes are provided with open bolt slots so that they are free to adjust themselves as the adjusting wedges are moved from one position to another.

In service the operation of the adjustable crosshead is as follows: Assuming that the wear on the crosshead shoes has progressed so that there is too much play between the guides, the bolts of one of the shoes are loosened, a jack set at the front between the shoe and



Rogatchoff Adjustable Crosshead Ready for Application

the crosshead and another jack at the back between the shoe and the main rod. The wedge bolt may then be taken out, the wedge moved to another hole and the wedge bolt replaced. Both jacks are then taken off and one jack set between one of the guides and the main rod. All bolts are then tightened and the jack taken off, the

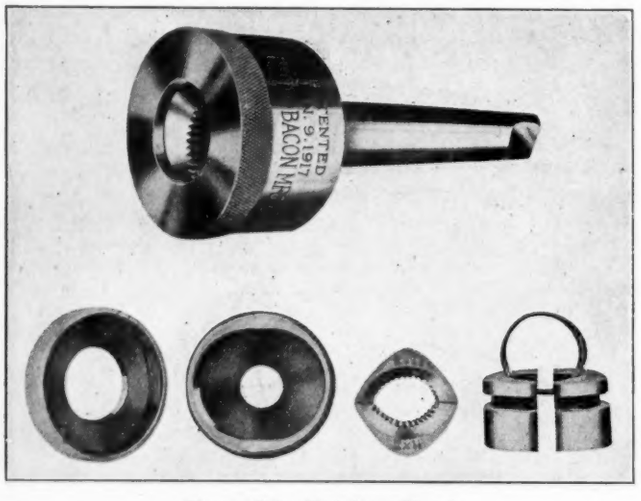
entire operation being completed and the locomotive again ready for service in a very short time.

This adjustable feature may be adapted to existing crossheads of the solid type as all the work that is required may be done in any railroad machine shop.

The performance of this adjustable crosshead, in test, gives promise that it will become an important addition to the economical operation of the modern locomotive as, because of its easy adjustment, it should reduce labor costs on crosshead work to a great extent, and for the same reason should permit a locomotive to remain in service a greater portion of the time.

Reversible Driving Chuck

THE GUSTIN-BACON MANUFACTURING COMPANY, Kansas City, Mo., has placed on the market a reversible driving chuck designed particularly for setting staybolts without the necessity for squaring the head. The device is specially applicable to setting staybolts by motor, for the reason that the jaws will retain their grip on the staybolt when the motor is reversed to return a bolt that is run too far or to remove staybolts. This reversible chuck is also applicable to driving straight shank reamers and taps. From the illustration of this device it will be seen that the chuck has two symmetrically placed jaws having an oval aperture, and that these are mounted in such a manner that the size of the chuck can be easily altered by changing the jaws. The chuck, however, will accommodate without change round bars varying 5/16 in. in diameter. It is claimed that in the operation of this chuck it will always run central, mak-



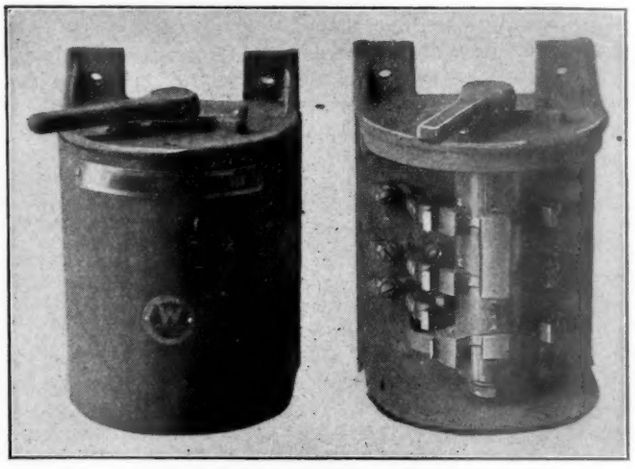
Reversible Driving Chuck

ing it easy to handle the motor, and that the jaws will not lock, no matter how hard the motor pulls. In the illustration the figure in the lower right-hand corner shows the form of jaws furnished with this chuck for use on square heads. When these jaws are used the chuck will accommodate any size between 5/8 in. and 7/8 in. without change.

It is believed that the use of a chuck which will handle staybolts without necessitating the heads being squared will ordinarily save a considerable amount of time and material. The design of the Gustin-Bacon reversible driving chuck is such that only the jaws will need to be replaced with wear, and as these are made from tool steel, properly tempered, they will last many months under usual service conditions.

Drum-Reverse Switch

THE 809 DRUM REVERSE SWITCH shown in the exhibit of the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., is designed especially for starting and reversing small alternating and direct current motors driving auxiliary apparatus on almost all equipment in railway repair shops. It is also serviceable wherever a totally inclosed, double throw, two or three pole switch is desired. The maximum horsepower for direct-current service is as follows: 115 volts—2.5 hp.; 230 volts—5hp.; and for alternating-current service: 110 volt—2.5 hp. and 220 and 440 volts—5 hp.



Drum Reverse Switch

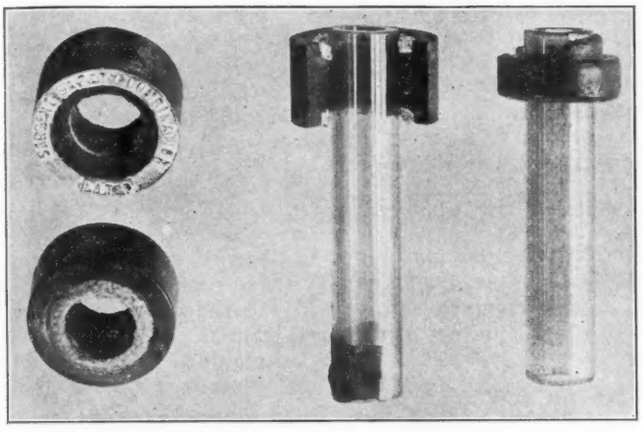
Arranged for suitable mounting on the machine base, the reverse switch is of compact construction. It is simple and rugged, neat in appearance and arranged for conduit wiring. All live parts are protected from accidental contact by means of an inclosing cover of sheet steel, lined with asbestos. The contacts, both fingers and drum segments, are of hard-drawn copper and brass, rated liberally to assure long life. The cover is easily removed to allow inspection and any adjustments that may be necessary. This switch is especially adaptable for connecting small alternating-current or direct-current motors directly across the line.

Safety Water Gage Gaskets

STOPPAGE OF CIRCULATION in water gages by flowed rubber gaskets has by record of the Interstate Commerce Commission and in the knowledge of many railway mechanical officials been a contributory cause of boiler accidents. When rubber is subjected to temperatures as high as that of the water in a gage glass it does not melt, but is liable to become plastic and flow through the clearance which must be allowed in a metal stuffing box for variance in size of the tubular glass ends and thus work into the water column so as to obstruct the passage of water to and from the gage glass. In the upper right-hand corner of the accompanying illustration will be seen an all-rubber gasket which has commenced to flow toward the end of the gage glass.

The Sargent safety water gage gasket is similar in form to the all-rubber gasket, but has two protective rings of asbestos cemented to the two points where flow would ordinarily take place. The rubber remains in contact with the gage glass, but only in the center of the gasket, there being a ring of asbestos surrounding the

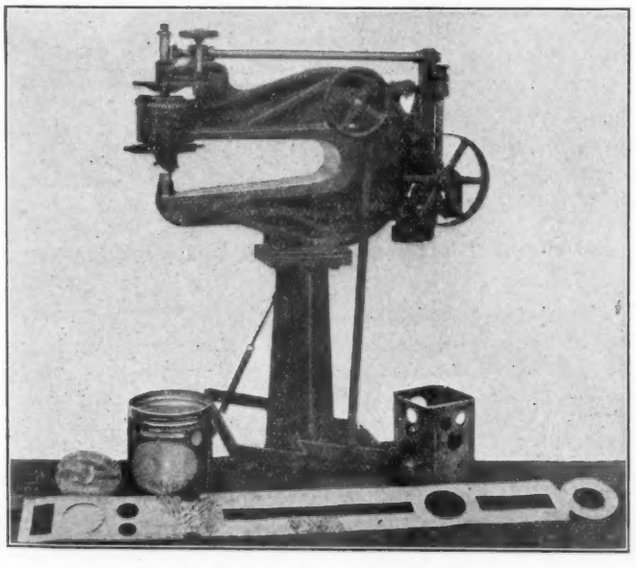
glass on either side of the gasket, as is shown in the sectional view of this gasket. This gasket is a new device, as safety gaskets previously manufactured by the Sargent Company, of Chicago, have had both ends of the rubber gasket entirely faced with asbestos. Perfection in design, particularly when it effects safety, is dependent on detail, and any water gage, no matter how well designed, may become inoperative by means of a faulty gasket. In view of this, the design of a safety gasket as described is an important development. The maintenance expense of water gage gaskets is so small an item that no pains should be spared to equip all gages with the best gaskets available.



Safety Gage Gaskets and the Ordinary Type

Turret Rotary Shears

A ROTARY SHEAR that cuts any shaped openings without cutting in from the edge and without turning the sheet, is being introduced by the Southwark Foundry and Machine Company, Philadelphia, Pa. This development in sheet and plate shearing is made possible by a turret, carrying the upper cutter, which while cutting can be changed to any degree of a circle about the lower cutter. The simultaneous driving of both cutters automatically pulls the sheet through the shear. The line to be cut is accurately followed by turning the guide wheel which controls the turret. This operation can be performed from either side of the machine. Openings in widths equal to double the throat depth and no limit on lengths can be cut.

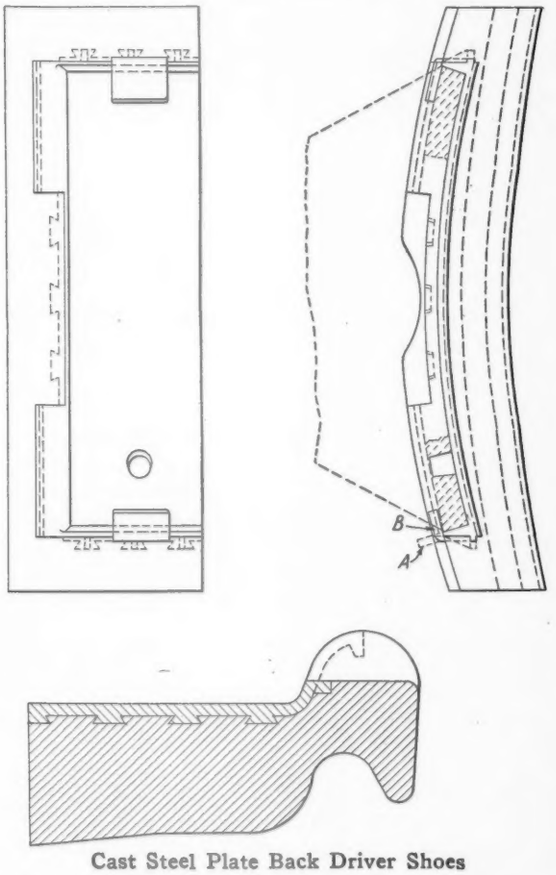


Gray's Turret Rotary Shear

The cutting of circular and oval shapes is done in a continuous operation. In cutting angles, the clutch is thrown out by means of the foot lever; the upper cutter is moved to a new position on the converging line; the power is thrown in; and the new cut is made to the first line. The cutting of zig-zag lines and small radii is made possible by a sensitive clutch controlled by the foot lever. The power is engaged by a mechanism that can be stopped and started within $\frac{1}{32}$ of an inch. The machine is made in five sizes to shear plate up to 1 in. thick.

Cast Steel Plate Back Driver Shoes

THE STANDARD BRAKE SHOE & FOUNDRY COMPANY, Pine Bluff, Ark., is exhibiting driving brake shoes with cast steel backs that embody several novel features. These brake shoe backs are all solid cast steel plates reinforced lengthwise by ribs which are dovetailed so as to engage the cast wearing portion of the shoe. This obviates the large bolt holes that must be punched through backs of the pressed steel type and provides a means of reinforcement not found on the pressed backs.



Cast Steel Plate Back Driver Shoes

A particularly interesting feature in connection with these brake shoe backs will be noted in the design of a new type of end hung shoe, in which a lug is cast integral with the back in such position that it will fit into a hole in the brake head where ordinarily a bolt is required to fasten the lower end of the brake shoe to the head. After the shoe is hung in place on the head the clip *A*

is bent over by a blow from a hammer to position *B*. The clip at the top of the brake back is made so as to engage the top of the brake head in the manner shown in the drawing of this device.

The use of a lug cast integral with the brake back and clips to engage the brake head at the top and bottom have several advantages in addition to simplicity of design. Where a bolt is used in place of the lug, the hole cast through the facing of the shoe very materially weakens it at that point and adds another item to the maintenance of the locomotive brakes. Not only must bolts be supplied where the lug is not used, but as may happen, this bolt may be left out through negligence, allowing the shoe to swing out of place or even to become detached and cause serious injury.

Air Hose Built Like a Cord Tire

GOOD AIR HOSE is an investment that readily justifies the purchase price of the best grade obtainable. The Chicago Pneumatic Tool Company, Chicago, Ill., among its products and accessories, is exhibiting a new grade of air hose that will interest users of pneumatic tools.

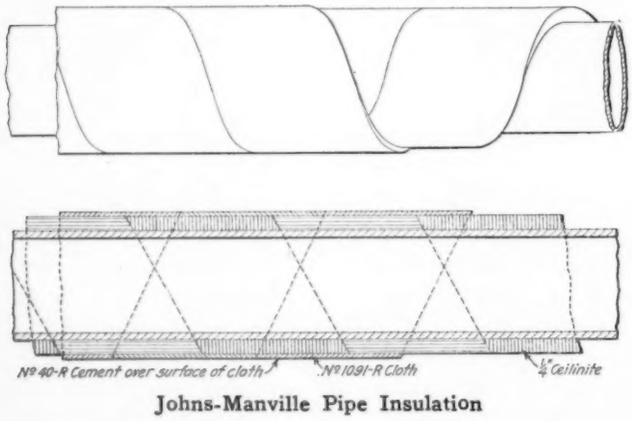
The hose is built like a cord automobile tire, is oil-proof and, it is claimed, resists deterioration to a remarkable degree. Its tough covering and braided construction results in a powerful structure which greatly reduces hose troubles and expensive replacements. Samples of this hose, sectioned to show its unusual construction, are on display.

New Johns-Manville Products

THE H. W. JOHNS-MANVILLE COMPANY, New York, has placed a number of new devices on the market since the last convention, among which the following are noted as of particular interest to railroad mechanical men.

Spiral Locomotive Pipe Insulation

This pipe insulation has been designed to provide a flexible covering that will adapt itself to the curved surfaces of small steam pipes in cab and also the main steam line to the air pump and turbo generator. A great many



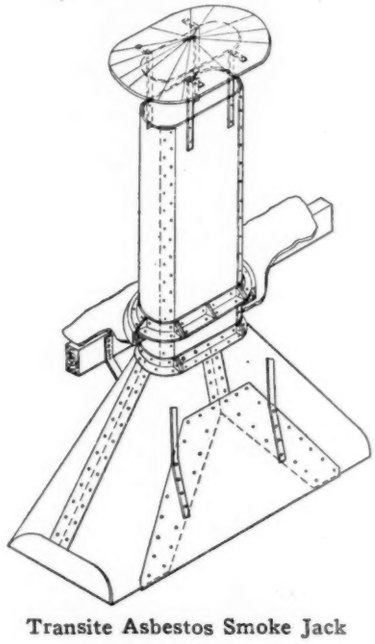
Johns-Manville Pipe Insulation

accidents have resulted in past years from engineers, firemen and hostlers putting their hands on these hot surfaces. The use of the insulation has entirely overcome this condition and in addition has acted as a conservation measure by reducing the radiation loss from pipes exposed to the outside temperatures. It was found on air pumps that when these pipes were uninsulated so much condensation was being delivered to the pump as to make it almost necessary to install a trap in the line.

The new insulation consists of the application of ¼-in. asbestos ceilinite to the outside of the pipe, wound spirally, over which is placed a layer of asbestos cloth, wound spirally in the opposite direction. The entire surface on the outside is finished with a special cement, which hardens and makes a surface that can be brushed against without deteriorating the material underneath. It can then be painted with ordinary locomotive paint to correspond with the finish.

Smoke Jack

This type of smoke jack has been designed so as to eliminate corner angles on account of the rapid deterioration that commonly occurs in the sharp angles. The smoke jack is constructed of transsite asbestos wood ⅜-in. thick, which is curved and moulded in the desired



Transite Asbestos Smoke Jack

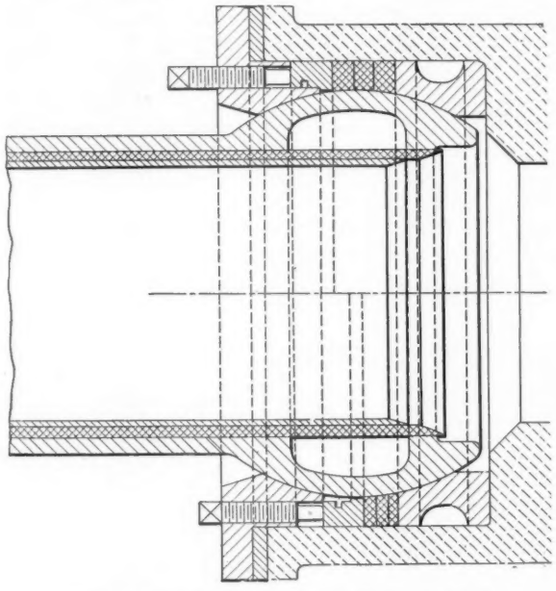
form. The use of broad curved surfaces and the elimination of angles also aids the free passage of gases and smoke, thereby assisting in the operation of locomotives under forced draft.

Exhaust and Receiver Pipe Ball Joints for Mallet Engines

A new design of these joints allows the quick application of a special packing material, all of the gland seats being flat instead of bevel, as in past practice. Packing spaces on all joints have been made a standard size: namely $2\frac{5}{16}$-in. when the packing is new, and when it has reached the limit of adjustment and the adjusting screw is against the bearing gland, the packing is renewed. By the clearance between the bearing glands and the head of the adjusting screw it can easily be determined from observation exactly how much further the packing can be compressed before it is necessary to remove it. Grooves have been turned into the packing follower so as to allow these to be easily removed by packing hooks. The diamond shaped metal ring, formerly used as a spacer between the packings, has been

eliminated, this space now being taken up by the three one-inch rings.

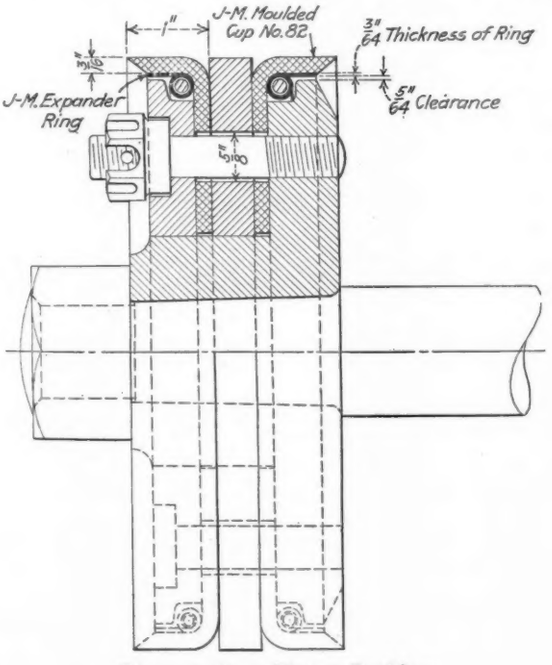
Steam leaks through the flexible joints on Mallet engines have been a source of annoyance, making it very hard for the engineer in cold weather to observe the signals. They also represent a waste of steam which this new packing arrangement is designed to overcome.



New Ball Joint for Mallet Locomotives

Reverse Gear Piston

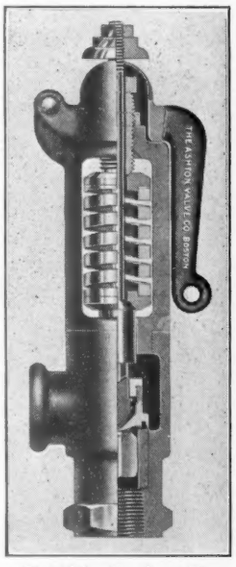
This design consists of a double piston with a metal filling piece and moulded cups with expanders between as shown in the accompanying sketch. The packing is similar to that previously designed for air brake cylinders and has already been tried on the Alco, Mellin, Lewis and other reverse gears and found to reduce air leakage in the cylinder and consequent creepage of the reverse gear. The reverse gear leakage problem is very serious, as is indicated in reports recently submitted by the Air Brake Association. The number of auxiliary devices requiring air from the brake system as a source of power has multiplied so rapidly that it is imperative that the utmost care be exercised to prevent any unnecessary loss of air through leakage. Moreover, the reliability of the reverse mechanism depends very largely on the maintenance of tight packing.



Reverse Gear Piston Packing

Pop Safety Valve for Superheated Steam

A TYPE OF POP SAFETY VALVE adapted for superheated steam service and exhibited by the Ashton Valve Company, Boston, Mass., is shown in the illustration. The special features embodied in this valve which make it particularly desirable for use on superheated steam are the cast steel body, nickel seat bushing and wing valve, strong lifting gear and general compactness of design. The spring is so located that it is entirely free from any exposure to the high temperature steam, which otherwise might affect the temper of the steel. The valve is finished with either screwed or flanged connections and in all standard sizes. The boiler code rules of the American Society of Mechanical Engineers provide for the application of safety valves on the superheaters of stationary boilers and this type of valve is well suited for the purpose.



Outside Spring Pop Safety Valve

Wertz Rod Grease Cup

ONE OF THE INTERESTING DEVICES being exhibited by L. W. Garratt, Pittsburgh, Pa., is the Wertz rod grease cup which is designed so that it will not work loose and fall off. This new device consists merely of the ordinary cup, screwed into the rod, with the usual plug inserted to force grease onto the bearing surfaces, but the new feature lies in the method used to prevent loss from the locomotive. The base of the cup is hexagonal in shape to permit use of a wrench in screwing it down, and one of the corners is tapped to take a $\frac{3}{16}$-in. machine screw. A $\frac{3}{16}$-in. hole is drilled in the rod directly beneath to a depth of $\frac{1}{4}$ in., taking the machine screw and thus preventing any turning of the cup. The plug is threaded for a distance of one inch, with 12 threads, and has two recesses opposite each other, cut to a depth of $\frac{1}{8}$ in. A stout flat spring, held in place by the head of the machine screw which enters the side rod, moves a pin through a small hole inside of the cup and enters the recess. One side of this recess, being cut to a slope, permits the plug to be screwed down as occasion demands, but the other side is cut perpendicular to the threads, and the pin actuated by the spring prevents a reverse movement. To remove the cup for filling the spring is merely drawn back while the plug is backed out.

Ball Bearing Screw Jack for Car Work

A NEW HIGH SPEED ball bearing screw jack for locomotivs was recently introduced by the Duff Manufacturing Company, Pittsburgh, Pa. The design differed from other screw jacks in having the operating mechanism in the base instead of in the head. This unique design has a number of advantages. The greater portion of the weight being concentrated at the bottom prevents the jack from being top-heavy. Another advantage is that the point at which the operating lever is pivoted does not rise with the load. This allows a full powerful stroke, regardless of the height of the load. The jack is also unusually easy to move about and place under the load to be lifted. The jack intended for locomotive use, which is of 75 tons' capacity, proved so popular that the company has now brought out a similar design of 50 tons' capacity for car work. With the increased weight and carrying capacity of freight cars used to-day the ratchet jacks are not powerful enough and are often unsafe.

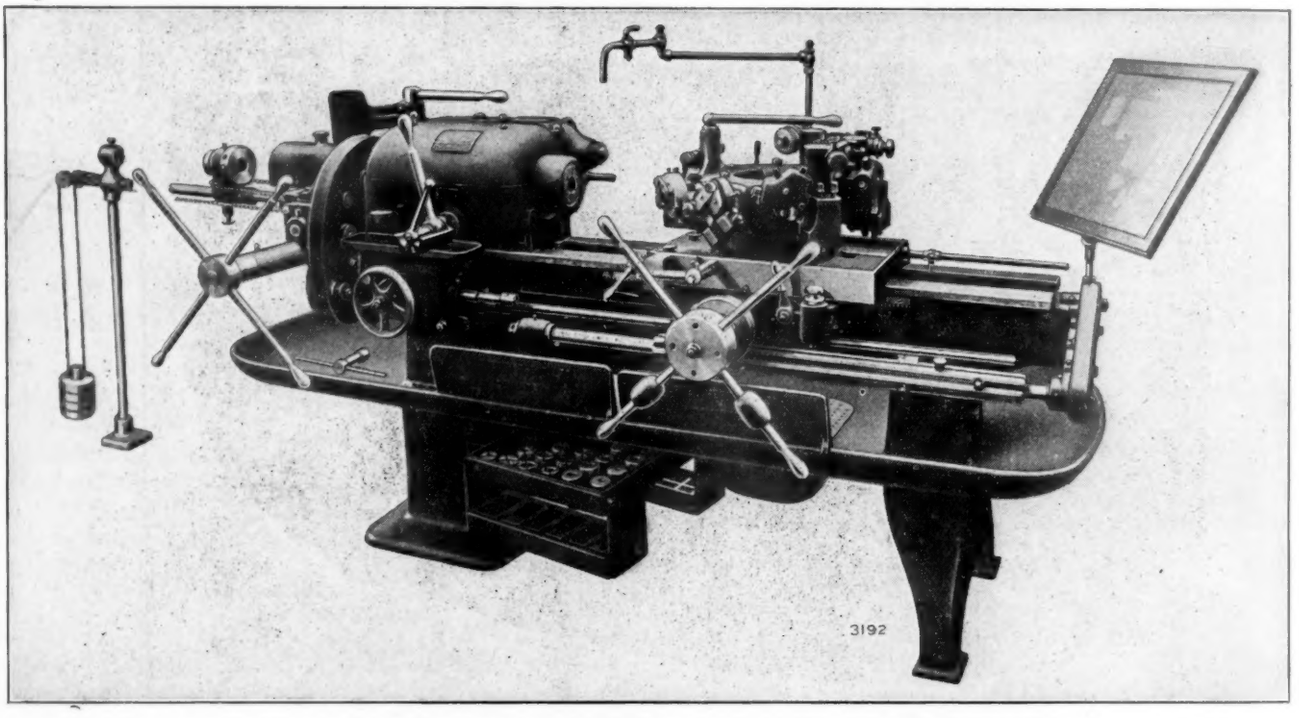
The mechanical principles of the new jack are the same as used in the 75-ton locomotive jack. The load is lifted by a six-foot steel lever which operates a double threaded screw through a ratchet and gearing. The screw has a very steep pitch and turns in a bronze nut. A positive clutch holds the load at all times and a signal is provided to indicate when the jack has reached its maximum height. For lowering, a crank handle is used, and while the lowering speed is high, the load can be stopped at any point desired.

While the 75-ton jack has permanent wheels for transporting it attached to the base, the 50-ton jack has a removable buggy by which it can be wheeled wherever required. This jack is made in a variety of heights, ranging from 20 to 36 in. A removable forged steel claw can be supplied for raising loads where there is not sufficient clearance to admit the head of the jack.

Hexagon Turret Lathe

AMONG THE MACHINES placed on the American market recently and exhibited by Alfred Herbert, Ltd., New York, is the No. 1 hexagon turret lathe shown in the illustration. This machine is designed for bar work and is made in three sizes to produce machined parts up to 3½ in. in diameter by 42 in. long. Forgings can be machined and in many cases work larger than 3½ in. in diameter can be handled. Work such as boiler staybolts having two threaded portions separated by an unthreaded portion can be produced by an arrangement of tandem die heads, the threaded portions being formed at the same time.

Taper work of greater length than can be turned by broad tools in the cut-off rest can be performed on this machine by means of a taper turner. Work of curved outline, to produce articles such as handles or balls, is done by means of broad form tools carried in the cut-off rest. A steady bush is used to support the work.



No. 1 Hexagon Turret Lathe With Geared Draw-in Chuck

Valuable features of the No. 1 turret lathe include power rotation of the turret, quick power motion of the turret slide, patented roller steady turners, dial feed motion and self-opening die head and dies. The automatic and dead stops act in either direction. Any number of stops can be used for any tool. These stops are carried by a hexagon bar geared to rotate with the turret and extending along the front of the bed. The stops trip the feed and act as dead stops. They are adjustable throughout the entire range of the lathe and are protected in such a way as not to become clogged up with chips.

An accurate indicator is furnished which enables dead lengths to be obtained within close limits of error. Its effect is to insure uniform pressure on the stocks independent of changes in pressure on the cutting tools as they become dull.

Railway Age

DAILY EDITION

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WE GUARANTEE that of this issue, 15,000 copies were printed; that of these 15,000 copies, 13,480 were mailed to regular paid subscribers to the Railway Age and the Railway Mechanical Engineer; 140 were mailed to advertisers, 280 were provided for counter and news companies' sales, new subscriptions, bound volumes, samples, copies lost in the mail and office use; and 1,100 copies for distribution at Atlantic City.

THE RAILWAY AGE is a member of the Associated Business Papers (A. B. P.) and of the Audit Bureau of Circulations (A. B. C.).

Don't Destroy Your *Daily*

If you do not care to preserve it, please hand it on to your neighbor or return it to the *Railway Age* office. Our supply of paper is limited because of the acute paper shortage. An ample number of copies have been provided for distribution at Atlantic City, but the attendance is so much larger than usual that it will be necessary to get the greatest possible use from each copy of the *Daily*.

Buying in Haste and Repenting in Leisure

Elimination of fuel and labor saving devices as a means for advancing the date of deliveries of locomotives recently ordered is inexcusable. The engines may arrive on the scene at an earlier date, but how about the time that may be subsequently lost in delays for steam because of the absence of two or three devices that would have enabled the fireman to maintain steam pressure? Difficulty in financing the purchase of new locomotives may be a more plausible excuse for eliminating devices that add to the first cost of the locomotive and it may be true that the device must return more than six per cent to justify its purchase to-day on an investment basis, but is it not a penny wise and pound foolish policy to eliminate devices that will save from 10 to 20 per cent of their first cost in a year on account of the initial cost? If the amount available for the purchase of new equipment is limited would it not be better to buy fewer locomotives perfectly equipped than a greater number of locomotives imperfectly equipped? Is not quality preferable to quantity when it comes to the most vital spot on the railroad? The address by Chairman Tollerton has answered this question in no uncertain terms. There must be no retrogression in locomotive development. The greatest single responsibility on the shoulders of mechanical executives is the responsibility for greater individual locomotive efficiency and capacity.

Stationary Boiler Plant Report

It is unfortunate that the report of the Committee on Modernizing Stationary Boiler Plants, presented during yesterday's session, was received without discussion because of lack of time. The fact that this is a subject which is perhaps not at the top of the mind of the average motive power department officer does not in the least detract from its great importance. The days of cheap fuel are past. The stationary boiler plants of the railroads, notoriously ill-equipped and loosely operated, demand attention. Chairman Tollerton's suggestion that the committee be continued, which was adopted, is to be highly commended. The committee has laid an excellent foundation for future work in the development of improved stationary practice and what is of equal importance, has also provided the members with a thoroughly practical basis on which to check up present conditions and learn, many of them for the first time, just how bad they are. As a result of this work there should be a material improvement in these conditions before the next convention. But, while the report deals largely with the possibilities for improvements in operation, accepting the equipment as it is found, it is to be hoped that the future work of the committee will lead to a full appreciation of the possibilities for economy and increased earning power of the investment in stationary power plants if they are given the same attention in the provision of modern facilities and the same care in design that is generally given to commercial and industrial installations.

Electrically Operated Planers

One of the most interesting applications of electricity has been its use in planer control. Planing machines were first belt driven with an arrangement of pulleys and belts for reversing the table motion and changing speeds. Belt drive from electric motors was then inaugurated, but was soon superseded by reversible, direct connected electric motors. The latest development has been the use of electricity to control table speeds, both before and during cuts, and the results in greater ease and flexibility of operation are most important. Among the advantages of electrical control may be mentioned the saving of time that results from speeding up the table between different pieces of work. For example, where planing operations are to be performed on a number of duplicate pieces, they are set up on the planer table and electrical control makes is possible to speed up the table when the cutting tool is in the gap between adjacent pieces. Another advantage is the possibility of speeding up between the beginning and end of a long stroke. The maximum resistance to the planer tool occurs when it first enters the work and a relatively slower speed will prevent tearing the work from the table. A slow speed at the end of the stroke is

necessary to prevent chipping off, especially in the case of cast iron. Between the beginning and end, however, the cut may be materially speeded up with a saving in time. Only a few years ago mechanical officers were struggling to get a successful pneumatic reverse for planers. To-day the job is quickly done by electricity with a much less complicated mechanism; this is typical of the way many other mechanical problems have been solved by the use of electrical apparatus.

Consider the Effect

Improved engine terminals are an outstanding necessity on practically every American railroad, but even if the increased size of locomotives did not make it imperative or the necessity for turning power quickly make it expedient, the reduction in operating and maintenance cost would alone warrant the thorough modernizing of every existing engine terminal. Consider the effect on fuel costs of engines held indefinitely under steam awaiting movement into a crowded roundhouse, or of fires kindled hours before the engine is required for service because it must be moved out of this same roundhouse to make room for another locomotive. Consider the effect on maintenance costs of postponing running repairs on account of the lack of suitable shop equipment at the terminal. It will not do to make engine terminals a dumping ground for old machinery that has been discarded from the back shop. A stitch in the engine terminal will save nine in the back shop and the tools must be available not only to make current repairs at the engine terminal, but to make them quickly. Delays occasioned by engines held at terminals while repair parts are forwarded from the main shop are more costly than machinery placed at the terminal where it will produce the repair parts. Inadequate engine terminals can increase maintenance of equipment costs tremendously and there should be a more consistent effort made to keep the equipment of the engine terminal on a parity with the back shop.

Improved Facilities Essential

Chairman Tollerton in his address very wisely emphasized the point that "the continued use of obsolete equipment, antiquated terminals and out of date equipment by any railroad or group of railroads leads to a direct tax in the form of higher freight and passenger rates." It is well known that until within recent years the cost of rendering railroad transportation steadily declined in the United States and that it continued to decline long after large increases in the wages of labor and in the prices of materials began to occur. It has commonly been said that the economies effected were due to "increased operating efficiency." This statement has been true, but it has contained only a part, and even a small part of the truth. The increases in operating efficiency which have been made have been rendered possible only by the provision, through increased investment of capital, of improved physical facilities. The great economies in the handling of freight have been due to increases in the number of tons carried per car and per train, but these increases in the number of tons carried per car and per train could never have been made if vast amounts of capital had not been invested in the reduction of grades, in improvements in terminals, in larger cars and more powerful locomotives, and in other improved facilities. In the future, as in the past, reliance for the economies which render it practicable to reduce the cost of transportation must be placed chiefly upon the investment of capital in improved facilities. This capital cannot be raised unless the railways are enabled to earn adequate net returns and the only way they can be enabled to earn adequate net returns is by letting them charge adequate rates. The gist of the problem of raising sufficient capital to provide the improved facilities which are necessary to enable the railways to operate with the maximum economy is, then, the problem of making the public realize that it must pay adequate freight and passenger rates now, and that the payment of adequate rates now is requisite to enabling them to charge relatively low freight and passenger rates in future years. Once the public is made to understand this, Mr. Tollerton's anticipation will be realized that the Transportation Act will "exert an immediate influence toward bringing into existence improvements long desired, but unobtainable on many railroads."

College Men and the Shop Agreement

Seldom has an editorial in the *Daily* attracted so many men to the *Railway Age* office on the pier as the one on "College Men on the Railroads," which was published on Wednesday morning. All of these callers were in hearty and substantial agreement on one thing, and that was the absolute necessity of getting as many technical graduates as possible into the mechanical departments of the railroads as quickly as possible and of maintaining a steady supply of recruits from this source in the years to come. There was some difference of opinion as to just how this should be accomplished. Some of the visitors maintained that the fact that the shop agreement made no reference to special apprentices and that the age limit which was specified for regular apprentices would shut out the college men, indicated that college graduates could not take a course in shop training; they supported their conclusion by saying that this interpretation had been placed on the matter by the Railroad Administration when it was in control. Other mechanical officers maintained that the fact that the shop agreement makes no reference to college men and special apprentices indicates clearly that it was not intended to keep them out of the shop; if that had been the intention it would have been clearly and positively stated. It appears therefore that some roads are taking on special apprentices—if they can get them—in the same way as they formerly did. These men are taken into the shop and given a general training in shop practice, with the distinct understanding that they are being prepared for official positions, and this is a matter entirely outside of the shop agreement and is something about which the labor unions need not concern themselves. The differences of opinion as to this point are so marked, however, that it would seem that the mechanical men should get together and have some definite understanding as to how the matter is to be handled.

The Cast Iron Fireman

The committee report on locomotive stokers was largely confined to a summarization of the replies received to questions that had been addressed to a large number of railroads, which were intended to bring out the important facts pertinent to the operation and maintenance of locomotive stokers in the light of current practice. As in all reports compiled in this manner, some interesting data were submitted relating to the subject, but there was not much that was decisive nor that pointed to definite conclusions

on important questions in regard to stoker operation. Where there was no uniformity in the replies received, it is unfortunate that the committee did not advance an opinion or theory of its own, even at the risk of erring a little on one side or the other of the question. But there was nothing evasive about the discussion; it came right to the point, which in this case appeared to be *the education of the locomotive fireman*—and the man on the other side of the cab. The discussion proved that mechanical men as a whole have arrived at a better understanding of the stoker and a better appreciation of its limitations as well as its possibilities. It was pretty generally assumed when the locomotive stoker first made its appearance that it would eliminate the human element in firing and because of the fact that it was possible to get more work out of stoker fired engines, the effect of this on the engineer so far as it affected his handling of the cut-off was widely overlooked. It is realized now, however, that the fireman must be as carefully trained to fire with stoker as to fire by hand, that reduced manual labor must not lead to relaxed mental effort and that the operation of the stoker requires constant and intelligent attention. The stoker has great possibilities, but to realize these possibilities in the form of increased locomotive efficiency and capacity the fireman must be educated. And in running the locomotive, particularly as this relates to the handling of the cut-off, the engineer must also be educated to show the same consideration for the cast iron fireman that he would have for a human fireman.

Delaying Work Because of High Costs

Chairman Tollerton in his address yesterday alluded to the fact that there might be a tendency on the part of the railways to postpone making improvements, such as those in locomotive facilities, because of present high prices and high wages. His remarks implied deprecation of any such tendency, and we believe the point cannot be too strongly emphasized that it will be a great mistake for any railway to postpone making needed improvements merely because of present high costs. In the first place, nothing could be more unsafe than to proceed on the assumption that present prices and wages are going to be reduced in the near future or even within the next few years. If past economic experience is any criterion, wages and prices ultimately will come down, but every economist knows that under present conditions there can be no certainty as to the future trend of prices or wages, and that whether they will come down or how much they will decline is purely conjectural. In the second place, for the railroads to postpone needed improvements because of present high wages of labor and prices of material, would be for them to contribute all they could toward preventing wages and prices from declining. If there is any one thing which may be said to be certain about future wages and prices, it is that there never will be any substantial and permanent decline in them until there has been a large increase of general production. Railroad transportation has become the chief factor limiting production in the United States and without an expansion of the capacity of the railroads there cannot be any substantial increase of production in this country. There can be no increase in the capacity of the railroads, in turn, without the doing of the work necessary to increase their facilities and their capacity. It necessarily follows that in the long run the railways can do more to reduce their own costs as well as to reduce wages and prices in general by going ahead with all the improvement work that present conditions make practicable, than postponing it in the hope that the cost of doing the work will decline.

Program For To-day

9.30 A. M. TO 12.30 P. M.

Discussion of Reports on:	
Fuel Economy and Smoke Prevention	9.30 A. M. to 10.30 A. M.
Auxiliary or Safety Connections between Engine and Tender.....	10.00 A. M. to 10.30 A. M.
Design, Maintenance and Operation of Electric Rolling Stock.....	10.30 A. M. to 11.00 A. M.
Scheduling and Routing Systems for Locomotive Repair Shops.....	11.00 A. M. to 11.30 A. M.
Superheater Locomotives	11.30 A. M. to 12.00 M.
Individual Paper on "Snow Fighting Apparatus," by W. H. Winterrowd	12.00 M. to 12.30 P. M.

ENTERTAINMENT

10.30 A. M.—Orchestral Concert, Entrance Hall, Million Dollar Pier.

3.30 P. M.—Orchestral Concert and Impromptu Dancing, Entrance Hall, Million Dollar Pier.

4.30 P. M.—Tea will be served in Entrance Hall.

9.30 P. M.—Grand Ball, Ball Room, Million Dollar Pier.

R. H. Aishton Delayed at Washington

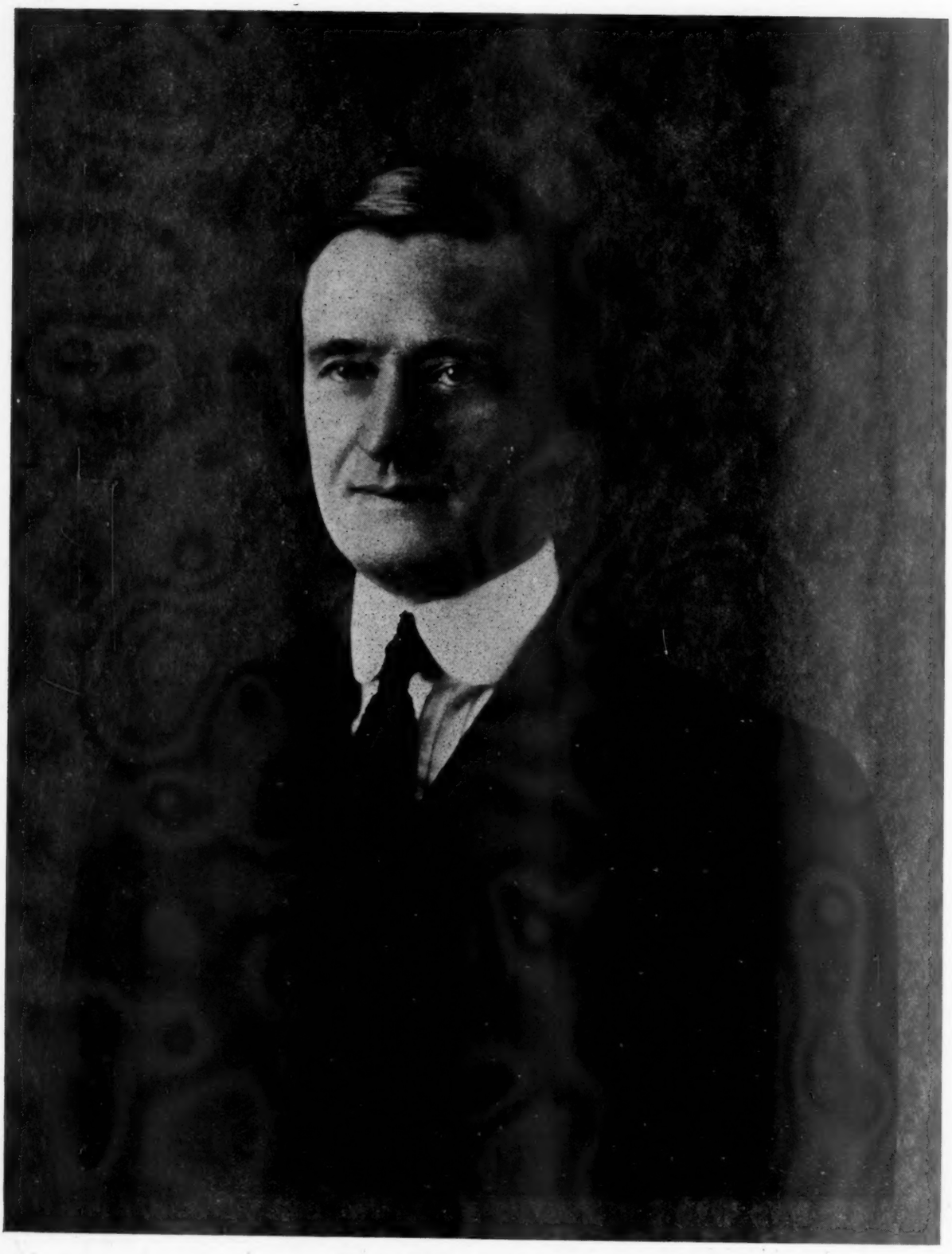
AT yesterday's session Secretary Hawthorne read a communication from R. H. Aishton, president of the American Railroad Association, who stated that the railroad situation at the present time required his presence in Washington and expressed regret that for that reason he was unable to be present at the convention. He hoped, however, to spend at least one day in Atlantic City during the meeting. In reply Chairman Tollerton suggested that Mr. Aishton spend the weekend at the convention if possible.

Italian Railroads To Be Electrified

THE NEW YORK *Sun* on Wednesday morning contained a despatch dated Rome, Italy, June 7, as follows: "Announcement was made to-day that a further sixty million lire has been appropriated for the purpose of electrifying the railroads, making a total of more than six hundred million lire for this use since January. Five thousand kilometers will be operating electrically before the end of the year, the announcement said. One hundred million lire also was appropriated to provide for construction of new railroads."

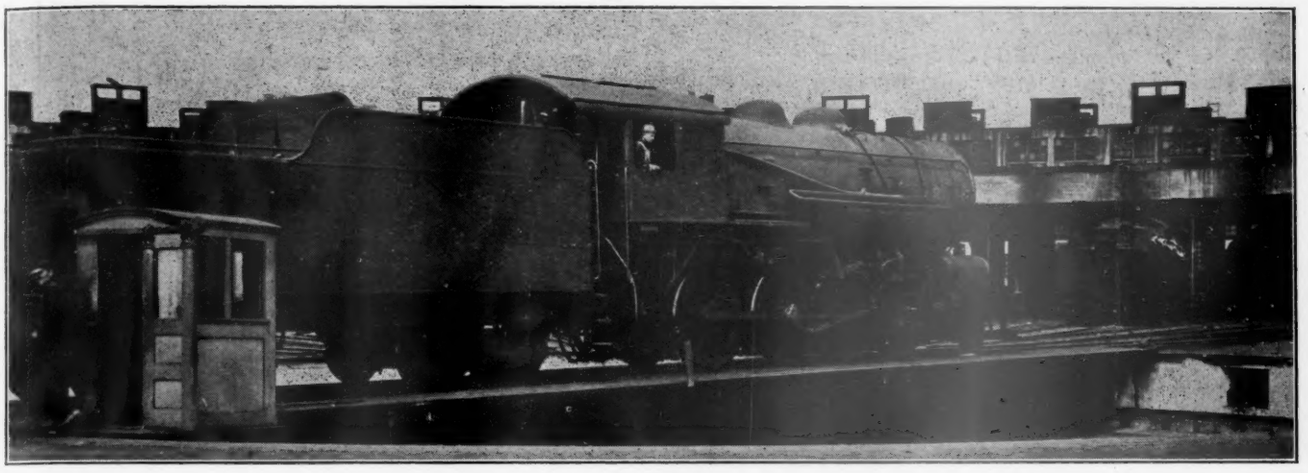
Car Heating, Limited

THE GYRATIONS of a print shop under the strain of getting out a *Daily* are usually either serious or amusing. In yesterday's *Daily*, by some juggling of type in the advertising of the Stone-Franklin Company, an announcement was made of the Stone-Franklin Car "Heating" System. This, of course, should have been Car "Lighting" System. If the Stone-Franklin representatives have been responding to inquiries about a new car heating system we can assure them that the fatherless heating system has been consigned to the hottest corner in the hell box and to-morrow morning we will return to the lighting system.



W. J. Tollerton, Chairman

Section III—Mechanical—American Railroad Association



American Railroad Association—Section III—Mechanical

Chairman Tollerton's Address the Feature of the First Session of the Convention

THE SECOND ANNUAL CONVENTION of the American Railroad Association, Section III—Mechanical, opened with a session in the Greek Temple on Young's Pier, Atlantic City, Wednesday, June 9, 1920. W. J. Tollerton, general mechanical superintendent of the Chicago, Rock Island & Pacific and chairman of the section, called the meeting to order at 9:40 a. m. The convention was opened with a prayer by the Reverend Newton W. Cadwell, D. D., pastor of the Olivet Presbyterian Church.

Chairman Tollerton then introduced Edward L. Bader, Mayor of Atlantic City, who welcomed the associations.

Address of Mayor Bader

Mayor Bader said in part: I have been interested in public life and in politics in Atlantic City, and I know that the Master Car Builders Association and the American Railway Master Mechanics Association, by which names your organization was previously known, were among the very first conventions that came to this place, some fifteen years ago, and they have always left more money in this town than any other convention that came here. (laughter.)

I know we felt the one year you left here, and I want to say right here that while I have only been in office one month, or less than a month, we don't want to lose you. We want to build up Atlantic City, and we can do that by having conventions such as this come into the town.

I was raised in the school of "hard knocks" and never thought that I would be called upon in later years to make a speech. I believe in doing things, and believe in having the cooperation of all my friends and the citizens of Atlantic City. I want to cooperate with you and if there is any time that any of you have any suggestions to offer for the benefit of Atlantic City, my door is always open and I will be glad to hear from you, and even by letter.

Always in the future remember that Atlantic City will do everything in its power to keep this convention here, because it is one of the biggest assets that Atlantic City ever had. With this in view, I present to you the key of the city.

In reply to the mayor's address Chairman Tollerton expressed his appreciation of the welcome extended in behalf of Atlantic City.

Address of Chairman W. J. Tollerton

AFTER WHAT HAS BEEN PERHAPS the most eventful year in the history of American railroads, I have again the honor to address you as Chairman of Section III-Mechanical.

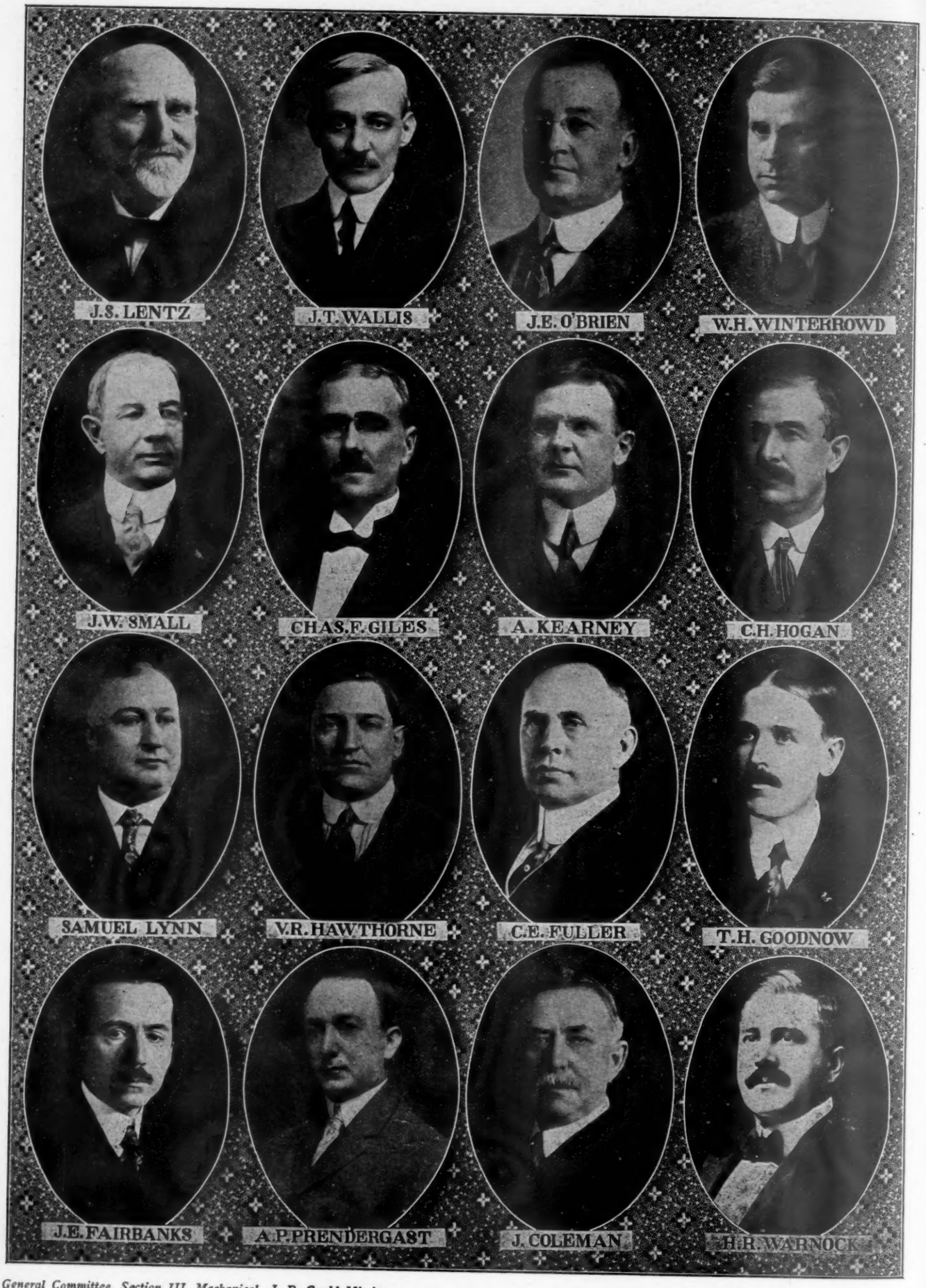
When I designate the past twelve months as the most eventful in the history of American railroads, I have in mind principally the fact that during this period the roads have been returned to private ownership under Federal legislation, which cannot help but have a very vital influence throughout the years to come. In many respects we have emerged from a cloud of uncertainty and, although numerous serious problems still remain unsolved, it seems to me that we are justified in viewing the future with a considerable degree of optimism.

It may appear that acts of Congress regulating the extent of government control and matters covered by the Transportation Act are far removed from our everyday work as mechanical department officers. While it is no doubt impossible to foresee just how much legislation is going to work out in practice, I feel that it will be advantageous for the members of Section III to study the probable effects of the Transportation Act, particularly in its relation to mechanical department affairs.

Adjustment of Labor Difficulties

One of its most important features is the proposed method for the adjustment of labor difficulties. While it may be too early to arrive at any conclusion as to the ultimate effect of this legislation upon the settlement of labor troubles, we can at least congratulate ourselves that a very excellent start has been made, and that in the establishment of a labor board means are provided tending to avoid serious disturbances, through orderly discussion and a just consideration by representatives of all concerned. If any method can be devised to relieve mechanical department officers of even a portion of their labor difficulties, it will at once lift a load of constant worry and enable us to concentrate more personal attention upon matters of operating efficiency.

In this connection I feel confident we will observe further beneficial effects of the Transportation Act. Upon examination of the provisions made under this act, enabling the roads to increase their net operating income, it seems evident that there will be a greater and more insistent demand than ever for railroad operation under conditions of maximum efficiency. This will apply particularly to those roads comprising traffic groups where high



General Committee, Section III, Mechanical—J. R. Gould Missing

rates are necessary to permit earnings of 5½ per cent on property valuation. When these rates are placed in effect it will become apparent that a close connection exists between the physical condition of railway facilities and the rates that must be charged, if the percentage allowed under the Transportation Act is to be earned. When it is clearly realized by the general public and their representatives that the continued use of obsolete locomotives, antiquated terminals, and out of date equipment by any railroad or group of railroads leads to a direct tax in the form of higher freight and passenger rates, means will undoubtedly be found to correct the situation. We may, therefore, anticipate that the Transportation Act will in all probability exert an immediate influence toward bringing into existence improvements long desired but unattainable upon many railroads.

Study New Appliances

Therefore, at this time more than ever before, it is our duty to keep thoroughly informed on all new appliances and to carefully study the merits of those devices which have as their object the bringing about of reduced operating expenses. The Railway Supply Men's Association has again assembled for your inspection a most complete display of modern railway necessities. Many of these devices are new and are worthy of earnest consideration. You are urged to spend as much time as possible in going over the exhibits, talking to the demonstrators and obtaining accurate information upon which to base intelligent recommendations for the improvement of rolling stock and repair facilities under your jurisdiction.

Speed Up Repair Work

The question of providing new equipment for immediate use in handling the traffic of the country presents a very serious problem at this time and one that should receive our careful consideration. Authorities estimate the shortage of equipment for present requirements at 262,000 freight cars, 5,000 locomotives and 5,500 passenger cars. These numbers will have to be added to very liberally during the next three to five years. As such tremendous quantities of railway equipment cannot be immediately produced, it becomes our duty to make every possible effort toward securing the utmost service from each unit now in existence. If the time locomotives and cars are held at terminals or in shops can be reduced the result is equivalent to that effected by the purchase of additional equipment; consequently, anything that can be done by the members of this association toward avoiding unnecessary delays and speeding up repair operations will be of extreme value during this crisis.

Difficulty in financing the purchase of new power and the desire to obtain rapid deliveries may in some instances exert a tendency to eliminate fuel and labor saving devices from locomotives recently ordered. As fuel represents the heaviest single item of material expense in the operation of railroads and as the indications are that this expense will continue to increase, I cannot see how it is possible to justify a policy of this kind. We should all be in a position to point out in a convincing manner the error of building locomotives today, in the construction of which we fail to incorporate those important devices of economy which have made the modern locomotive a machine of high efficiency as compared with locomotives of the older types.

It is of equal importance that every effort be extended to maintain a suitable relation between the amount of power and other equipment provided for and the available facilities for repairing and handling this equipment if we are to operate with the desired degree of efficiency. Our car and locomotive repair shops, roundhouses and terminal facilities should be improved and enlarged coincident with, or prior to, the time additional equipment is secured. In view of present abnormal conditions there may be a tendency to delay these important improvements, awaiting possible lower labor and material costs. This tendency, however, should not be permitted to extend to such a point as to postpone the installation of facilities, the lack of which will cause a loss greater than the possible, but uncertain, saving anticipated at some later date.

Mechanical Section III has a very important obligation before it in seeing that the best possible standards and recommended practices are set forth, that the new equipment will be so designed as to require minimum maintenance expense and have the greatest possible availability for service. We have a splendid organigation of committees, and there is not the slightest doubt in my mind that the Mechanical Section of the American Railroad Association will prove equal to this important duty.

Comments on Committee Reports

In this connection I desire to particularly mention the work of the Committee on Standard and Recommended Practice, and to call your attention to the fact that Section-III now has a manual containing the standard and recommended practices adopted by both the American Railway Master Mechanics' and Master Car Builders' Associations, which have been harmonized and brought up to date under the supervision of the above committees.

Numerous important and interesting reports will be presented at this meeting, representing a great deal of thought and labor on the part of committee members. Upon reading over the committee report on Modernization of Stationary Boiler Plants, it impressed me as being an exceedingly valuable addition to our knowledge upon this subject. In view of the ever-increasing cost of fuel, our stationary boiler plants will require careful attention. The committee points out where to look for inefficient conditions and how to remedy these conditions when found, together with important information pertaining to boiler plant equipment and special methods of fuel combustion.

The report on scheduling and routing systems for locomotive repair shops covers a subject of timely interest. A study of this report will enable you to understand the best systems now in use upon various railroads, and will also be of great service in the consideration of similar plans for the handling of locomotive repair operations in shops under your jurisdiction.

In my previous address before this association I advocated the establishment of a joint testing and research bureau. The committee appointed to study this matter has submitted a very instructive report and calls attention to the vast service such a bureau would be to the railroads. In order that the various phases of the subject may be thoroughly developed it is my recommendation that this committee be continued.

The Committee on Engine Terminals, Design and Operation, also the Committee on Repair Shop Layouts, have accumulated valuable information covering the general trend of terminal improvements. They have not, however, been able to submit definite recommendations, due to the fact that the various railroads express a wide difference of opinion on practically all matters pertaining to the above subjects. You will realize that many of the questions involved are governed largely by local conditions, so that it is difficult to formulate recommendations sufficiently broad to cover the entire situation. Judging by progress made I am confident that, if these committees are continued and given sufficient opportunity, it will be possible to harmonize the different ideas advanced by the various railroads and eventually secure valuable recommendations as to the best practice in the design and operation of terminal facilities.

The owners of the pier and meeting hall should also receive our hearty thanks in view of the many important improvements made since the last Convention. I will therefore suggest to the Committee on Resolutions that an appropriate resolution be prepared to this effect.

In giving consideration to the various matters pertaining to railroad affairs, we should all realize that these problems are indirectly of vital importance to the entire nation. I feel confident you will continue to give them the benefit of the same earnest thought and endeavor which has been so much in evidence during the past history of this organization.

Association Business

The minutes of the annual meeting of 1919 were approved and the chairman announced the appointment of committees as follows:

Committee on Subjects, Willard Kells, (A. C. L.); W. H. Sample, (Gd. Tk.); H. M. Curry, (N. P.) H. R. Warnock, (C. M. & St. P.) and Wm. Schlafge, (Erie).

Committee on Resolutions, C. E. Chambers, (C. of N. J.); F. W. Brazier, (N. Y. C.) and H. T. Bentley, (C. & N. W.).

Committee on Correspondence, A. W. Gibbs, (Pennsylvania); John Purcell, (A. T. & S. F.) and A. R. Ayres, (N. Y. C. & St. L.).

Report of the General Committee

SINCE THE LAST ANNUAL MEETING, the General Committee has held meetings on the following dates: June 23, 1919; September 23-24, 1919; November 13-14, 1919; March 30-31, 1920, and May 25, 1920.

The membership of the Section at the present time includes 198 railroads, representing 346 memberships in the American Railroad Association, and in addition thereto, 108 railroads, associate members of the American Railroad Association. These railroads, members and associate members of the American Railroad Association, have appointed 603 representatives in the Mechanical Section. In addition, there are 1235 affiliated members, and 126 life members in the Section.

Since the last session of the section the General Committee has taken action on several important subjects. This action is outlined in the following brief report and your approval is respectfully requested.

RULES OF INTERCHANGE

During the year several necessary changes in the Rules of Interchange have been made and included in Supplements Nos. 1 and 2 and Circular S III-149.

PROCEEDINGS OF THE 1919 ANNUAL MEETING

The proceedings of the 1919 Annual Meeting have been printed and distributed to the members.

MANUAL OF STANDARD AND RECOMMENDED PRACTICE

The Standard and Recommended Practice of the Section has been brought up to date and compiled under the direction of the Committee and Recommended Practice in a loose-leaf volume designated as "The Manual of Standard and Recommended Practice." All drawings have been retraced and new cuts made and included in this one volume together with the text. Arrangements have been made to continue the printing each year of the historical record of the development of the Standards of the Section as an appendix to the Annual Proceedings.

LETTER BALLOTS

The letter ballots ordered taken at the last session have been taken, and the result announced to the members in Circulars Nos. S III-74 to S III-85 inclusive, and appropriate changes made in the various rules and standards.

MAXIMUM LOAD MARKINGS ON FREIGHT CARS IN LIEU OF NOMINAL CAPACITY

The letter ballot ordered taken on this subject at the last session as a result of the report of the Committee on Car Trucks, resulted in its adoption by more than the required two-thirds majority. The General Committee has held conferences with representatives of the Traffic and Transportation Sections to provide for the necessary adjustment in tariffs, and rules will be promulgated within a short time.

EQUIPMENT PAINTING DIVISION

The former Master Car and Locomotive Painters' Association has been united with the Section as the Equipment Painting Divisions, and negotiations are in progress with several other mechanical associations with a view of establishing other divisions of the Mechanical Section.

INTERCHANGE RULES AGREEMENT

A form of Interchange Rules Agreement has been prepared which has been approved by the Executive Committee of the American Railroad Association at its session held November 19, 1919, and by the Association of Railway Executives. A list of railroads and car owners who have executed this agreement is attached to the report of the Arbitration Committee.

SCHOLARSHIPS

The usual circular has been issued announcing vacancies in the scholarships under the charge of the Section.

CHANGES IN STANDARDS AND RECOMMENDED PRACTICE

Upon recommendation of the Committee on Standard and Recommended Practice, the General Committee has eliminated the following items from the Manual of Standard and Recommended Practice:

Brake Chains.—Standard. Eliminated account of being covered by Standards for Safety Appliances.

Brake Staff Carrier Iron.—Standard. Eliminated account of being covered by Standards for Safety Appliances.

Safety Chains.—Recommended Practice. Eliminated account of their use being generally discontinued, and also in view of action taken at the session of the Section held June 19-20, 1918.

Guard Rail and Frog Wing Gage.—Eliminated account of being properly a standard of Section II-Engineering.

NOMINATING COMMITTEE

The General Committee offers the names of the following members as candidates for the Committee on Nominations: F. W. Brazier, New York Central; H. T. Bentley, Chicago & Northwestern; J. J. Hennessey, Chicago, Milwaukee & St. Paul; C. E. Chambers, Central of New Jersey; Wm. Schlafge, Erie; M. A. Kinney, Hocking Valley; R. W. Bell, Illinois Central; A. W. Gibbs, Pennsylvania. W. J. Robider, Canadian Pacific; J. Hainen, Southern.

Discussion

On a motion by C. E. Chambers, seconded by T. H, Goodnow, the report was received and approved.

Report of Committee on Nominations

THE TERMS OF OFFICE of the Vice-Chairman and seven members of the General Committee expire June, 1920, and the committee nominated the following to serve until June, 1922:

For Vice-Chairman, J. Coleman, S. C. D., Grand Trunk. For members of the General Committee, J. S. Lentz, M. C. B., Lehigh Valley; H. R. Warnock, G. S. M. P., Chicago, Milwaukee & St. Paul; C. E. Fuller, S. M. P. and M., Union Pacific; Willard Kells, G. S. M. P., Atlantic Coast Line; John Purcell, Ass't. to V.-P., Atchison, Topeka & Santa Fe; H. L. Ingersoll, Ass't. to Pres., New York Central, and J. J. Tatum, S. C. D., Baltimore & Ohio.

The report was signed by F. W. Brazier (Chairman), New York Central; H. T. Bentley, Chicago & North Western; J. T. Wallis, Pennsylvania; D. R. MacBain, New York Central, and J. J. Hennessey, Chicago, Milwaukee & St. Paul.

Discussion

F. W. Brazier: I would like to straighten out one thing that some of the members do not understand. If you will read your By-laws carefully, you will find the Nominating Committee have followed your By-laws correctly by presenting only one name. Any 20 members that are not satisfied with this can have the privilege of filing with the secretary other names.

The report was accepted without discussion.

Report of Committee on Mechanical Stokers

THERE are in use on the locomotives of the United States over 5,000 mechanical stokers. The stoker was first commercially a fact in the year 1910. Several types of stokers had been receiving experimental attention for several years prior to that date, but this marked the beginning of the time that railroads started the application on new power of extraordinary weight and tractive effort, realizing that to get the most out of the locomotive of high capacity some mechanical means must be provided. In 1912 demand was made by the firemen in the eastern wage application for two firemen on locomotives weighing over 200,000 lb. on the drivers; this naturally stimulated the inventive genius of the stoker manufacturers and improvements came out that made the stoker a success.

The determination of the point in locomotive size at which the application of stokers shall begin, the economy of fuel that may be expected, the cost of repairs, and not the least point to be considered, the kind and preparation of fuel, have been the subjects that the members have discussed more than any others during the past seven years in which the subject of stokers has been before the association. In order to arrive at a definite understanding as to the general opinion on these matters the committee issued a questionaire, to which replies were received from 30 railroads. The questions with the committee's comments are given below.

QUESTION 1.—State the number and kind of stokers you have and type and tractive effort of locomotives on which they are used.

Replies were received from several roads using over 100 stokers and one road reports 563 stokers in use. The Mikado, Santa Fe and Mallet types predominate, with tractive effort from 54,000 to 135,000 lb. There were a limited number of Consolidations with tractive effort as low as 51,000 lb. It is apparent that the locomotive of less than 55,000 lb. tractive effort has not received much consideration.

QUESTION 2.—What is the tonnage rating on type of locomotives in territory where operated? Is there any difference in the tonnage rating on hand-fired and stoker-fired locomotives of the same type in the same territory?

(Questions 3 and 4 are in effect the same as Question 2.—Editor.)

The difference in rating between hand-fired and stoker-fired locomotives is hard to determine, few railroads having both types of firing on the same class of locomotive. Some of the larger users of the stoker report increasing loading 150 tons on a 2,400-ton train, and 400 tons on a 4,600-ton train with the stoker-fired locomotive over the hand-fired on the same division. Where the stoker and hand firing are used on the same type of locomotive, with one exception, replies indicate as good performance can be secured with the stoker with increased tonnage as with the hand-firing with reduced rating.

QUESTION 5.—How does the condition of fire of the hand-fired locomotives compare with the stoker-fired locomotives when arriving at terminals.

The general answer to this question, "Better condition on stoker-fired," demonstrates that the firemen soon realize the advantages of the stoker and will endeavor to carry a light, even fire, which can easily be accomplished by ordinary attention.

QUESTION 6.—Do your records indicate any decrease in boiler maintenance with the stoker-fired locomotives as compared with the hand-fired locomotives, in parallel cases?

The committee calls attention to the advantages of maintaining a fire box temperature while trains are standing that will minimize the detrimental results of rapid contraction in large fire boxes. This can be accomplished by keeping a light, even fire easily controlled with the stoker.

QUESTION 7.—Do you use two firemen, or a relief fireman, or give the fireman any assistance on your hand-fired locomotives?

The majority of roads report "No."

QUESTION 8.—State what prompted you to apply stokers to particular classes of locomotives.

With one exception all answers report "Increased tonnage and size of locomotives." One representative reply was: "A better class of men can be recruited and held as firemen"; another: "The fireman can devote more time to improving himself in the necessary knowledge he requires to become an engineer." One large road states "The stoker is considered a positive necessity where coal consumption averages more than 5,000 lb. per hour." All replies, with one exception, call attention to the operation of large type locomotives under maximum conditions, stating that the mechanical stoker is essential.

QUESTION 9.—With the experience you have had with stoker-fired locomotives, please express your views on economy of fuel and efficiency of the locomotive as to speed and tonnage compared wiith hand firing, either with run-of-mine or prepared coal.

With one exception, the replies to this question are in line with all reports that have been made previously by the stoker committee, namely, that more coal is burned by the stoker-fired locomotives than by the hand-fired, but the increased capacity as to tonnage and speed offset any loss in amount of coal consumed for a given service. The users of stokers realize that fine coal to the extent it is handled by the stoker increases stack losses; the education of the fireman is just as essential as in hand firing, and not to be lost sight of is the fact that stoker firing is mechanical rather than a human operation, and it is for the manufacturers to improve the mechanical condition to remove human inefficiency.

QUESTION 10.—What percentage of the run-of-mine coal you receive for locomotive use is slack? If this coal is prepared at a crusher, how much is the slack increased?

Local conditions govern the answer to this question. From 20 per cent to 50 per cent of so-called slack was reported. The term "slack," as used by several roads, is the amount of fine material passing through a four mesh per sq. in. screen. One road reports the slack as increasing from 35 per cent to 50 per cent by crusher, and another from 15 per cent to 75 per cent. All others report "No coal prepared by crusher."

QUESTION 11.—What do you estimate the additional cost of maintenance where stokers are equipped with crushers?

All roads report "No data."

QUESTION 12.—Are you in favor of coal crushers with stoker equipment on locomotives? State reasons.

This question is one of the most discussed and possibly the most serious in connection with the mechanical stoker, owing to the fact that the answer depends on local conditions. The answers received to this question were practically unanimous to the effect that the locomotive equipped with the mechanical stoker, to make it a complete machine capable of operating over a wide territorial range, should have the crusher on the locomotive. The committee concurs in this where a limited number of stokers are being used, but as locomotives equipped with the stoker are centralized it becomes possible to prepare the fuel before delivery to the tenders. The manufacturers are confronted with conditions in the application of the crusher to the locomotive that will require their best talent to meet as the stoker is placed on more railroads. The hardness of the coal causes an extremely wide range of conditions the country over. The strengthening of the crusher parts and making the crusher mechanism detachable so that prepared coal can be used on crusher locomotives without continuing the operation of the crusher parts, are recommended by the committete.

The opinion has been advanced that coal should be prepared at the mines. Where railroads own their own mines and the entire output of some coal mine is controlled this suggestion has its merits, but with the unsettled conditions in the mining industry for the past few years, the changing of contracts and the uncertainty at all times of being assured a full supply of fuel for stokers, this suggestion can not be recommended. The coal, if prepared before being delivered to the tenders, should be

crushed at the railroad coal tipple or a centralized crushing plant on the railroad.

QUESTION 13.—Do you prepare coal for stokers before loading it on the locomotives? If so, by what methods and what does it cost by each of these methods?

Where coal is prepared before being placed on the locomotive it is bought in that state or screened at the railroad coal tipple. One railroad reports crushing at the fuel station but the cost is practically negligible as the coal is dropped from the car into the crusher and prepared before it is elevated. The capital expenditure necessary to install the equipment for this method will be from $6,000 to $12,000 at each coaling station where electric power is available.

Inquiry was made of the stoker manufacturers as to the number of stokers in service March 1, 1920. This information is given in the table.

NUMBER OF STOKERS IN SERVICE MARCH 1, 1920.

Kind of Stoker	Mallet	Mikado	Santa Fe	Centipede	12-Wheel	Decapod	Consolidation	Mountain	Pacific	Total
Street	424	638	357	4	14	....	21	3	36	1,497
Duplex	422	1,139	441	....	....	123	22	28	20	2,195
Standard	120	338	36	....	33	....	21	162	21	731
Hanna	70	6	73	....	16	....	....	4	....	169
Elvin	....	....	19	....	....	....	....	....	....	19
Crawford	....	50	35	....	....	....	337	....	93	515
Total	1,036	2,171	961	4	63	123	401	197	170	5,126

Lignite

The question of using so-called ignite fuel, has been referred to this committee. Reports indicate that no difficulties are being experienced in firing with this fuel, if handled properly. Stack losses and fires along the right of way are not developing. One road reports less liability of fire, on account of the more even character and regularity of the fire, and doing away with the necessity of opening the fire door, which creates sparks with this class of fuel. The only change noted in fire box or draft appliances to burn lignite, was the report of one road that one more row of fire brick is applied.

The question as to what recent changes have been made in coal space of locomotive tenders to permit the coal to flow within easy reach of the fireman, was referred to this committee. Replies state that several railroads have resorted to a mechanical device for pushing the coal forward which was reported successful in various sections. Existing power has been largely cared for by local arrangements of changes in slope sheets and raising and moving coal boards.

The report was signed by M. A. Kinney (Chairman), Hocking Valley; A. Kearney, Norfolk & Western; J. T. Carroll, Baltimore & Ohio; J. W. Cyr, Chicago, Burlington & Quincy; A. J. Fries, New York Central; A. G. Trumbull, Erie; W. C. A. Henry, Pennsylvania System; W. J. Bohan, Northern Pacific, and E. J. Brennan, Chicago, Milwaukee & St. Paul.

Discussion

C. E. Chambers (C. of N. J.): As a representative of a road which has a few locomotive stokers, I want to say something on this subject. I have noted that part of the report of the committee, in which it is stated that the stoker locomotive would burn more coal for a given amount of work than a hand-fired locomotive, but I believe that, with proper regulation and a properly designed stoker, we will see the time when we will burn less coal for a given amount of work than with hand-firing.

The great opportunity for improvement is the proper education of the fireman in the coaling of the locomotive with the stoker. If you can teach a fireman to starve his engine, it is wonderful what results you can get—you can pull a heavy-tonnage train, with a proper starving of the engine, with a much less quantity of coal than if that element is neglected, and that is one of the great things we have to do in the future, develop the fireman not to let the engine get away from him, and to educate him in letting the fire starve down all the time, so that you have a thin fire on the grate with the best combustion possible.

During the past two years the first stokers have been in service on the New Jersey Central, and the work so far performed has been very gratifying. The last locomotives placed in service have been in service for but a short time—they were designed with a wider firebox than the standard U. S. locomotive, with which we were furnished formerly, and they are giving us very greatly improved service.

The quality of coal which we burn on our railroads varies very greatly from time to time, and it makes it necessary to have a large grate area in order to get proper service, and this has been thoroughly demonstrated by increasing the firebox, and since that has been done, we have been much gratified by the results attained.

Prof. L. E. Endsley (Univ. of Pittsburgh): It is no doubt thoretically possible, at least, to draught the engine less because of the fact that you do not open the door of the firebox. When you open the door of a locomotive you reduce the vacuum in the firebox by letting a large amount of air in. That air, coming in through the door, is not doing the work that the air does when it comes through the grate, and when it comes through the grate it is warmed up and ready to do the work quickly.

In a stoker-fired engine, that inrush of cold air reduces the vacuum, and is not necessary, in my opinion, and I am wondering if any of the members have had any experience in attempting to increase the size of the nozzle in a stoker-fired locomotive, and do just what Mr. Chambers says, reduce the thickness of the fire by starving the fire.

You know that you can fire a locomotive with a thick fire, which is too thick, or a thin fire, which is too thin. The right amount of fire in a stoker locomotive can be maintained more uniformly than by the fireman putting in a large amount of coal in one place. The stoker that covers the firebox uniformly can maintain the maximum efficiency, and not have any inrush of cold air, or stoppage of the more efficient warmed air, coming through the grate, and I think, as Mr. Chambers says, when we get to a point of educating our firemen how to correctly operate the stokers and reduce that inrush of cold air, we are bound to have just as efficient a locomotive, in the case of the stoker-fired engine, as in the case of hand-fired engines, but it will not come about by maintaining the same draught all the time, by reason of having a thicker or thinner fire, and thereby getting an inefficient burning of your coal.

E. W. Pratt (C. & N. W.): I am rather surprised to hear a scientific man like Prof. Endsley tell you the air must come through the grate, as that is what I thought, until a few years ago, the Bureau of Tests showed us that in order to have efficient operation of the stoker, two-thirds of the air had to come from above the fire, and that there was practically no free oxygen two and a half inches from the bed of coal. You can all get the pamphlet issued by the Bureau of Standards on that subject, showing extensive and careful tests.

Prof. Endsley: I do not think Mr. Pratt will find in any place, as the result of investigation, that an opening 18 in. long and 12 in. wide will bring air in efficiently. Openings along the side of the grate uniformly will assist in bringing the air in efficiently, but it is not necessary to have air come through the grate, and it is not an efficient thing to open the firebox door.

No doubt you can assist combustion by putting air in all around the fire, above the grate, but you cannot assist it by putting in a large amount of air that travels almost the entire length of the flue sheet before it gets to the proper temperature.

C. E. Fuller (U. P.): Prof. Endsley made a statement I want to refute. There are certain coals which require all the air on the fire that it is possible to get through the open door from the time the engine leaves one terminal until it reaches another. In such cases the door of the engine is wide open and is never closed. By means of this practice you will get a higher temperature both of superheated and saturated steam.

I was wondering, when Mr. Chambers was talking about stokers, whether or not we are considering the size of the firebox and grate surface in the application of stokers. Are we asking the stokers to do the same thing on all engines? In other words, are we building the engines and afterward putting the stokers on or building the firebox for a stoker.

In my opinion, the one thing which makes all the difference

in the world, whether you will burn more coal with a stoker-fired engine than with a hand-fired engine, is whether or not you have the proper grate area. If you put the stoker on an engine, with a limited grate area, I think it will burn more coal than a hand-fired engine, and I do not believe you can help yourself. If you get a large grate area you will save fuel, but as to the point of leaving the door open, I believe Professor Endsley to be absolutely wrong.

There is a certain coal fired on our railroad over a division about 1,000 miles long, on which the lomocotives are equipped with the Bates door, and the door is always half open—we throw the coal in, and the door is open from the time the engine leaves one terminal until it reaches another. There is no other swinging door that can compare with it, so far as economy and efficiency are concerned.

Chairman Tollerton: I would like to hear from Mr. Kearney on the subject of stokers.

Mr. A. Kearney (N. & W.): The Norfolk & Western is the user of a great many stokers. We started out in the beginning with the over-feed stoker; then we made some tests with the Crawford, then later with the other forms of stokers as they came along, and finally we have the Duplex. In all, we have quite a number of stokers in service and all of our large engines are now so equipped.

I have never subscribed to the idea entertained by so many about the difference between hand-fired and stoker-fired locomotives, and maybe it is because I have a wrong conception of the whole thing. I think it is very unfair to compare hand-firing with stoker-firing for the reason that the stoker does not begin to do its work until after hand-firing has about ended. By that I mean, we all know in a practical way, and we have known it from actual tests, that any careful fireman can beat a stoker-fired engine. There is no doubt about it, with proper care.

But imagine a couple of parallel lines carried along—one is a stoker and the other hand-fired. When the hand-firing is at its best, and we will assume that it has the best grade of coal for hand-firing, it will beat the stoker firing; but right there the hand-firing ceases and stoker-firing begins. You can use a poorer grade of coal and get a larger capacity out of your engine. Now, imagine that curve extended twice the length, or considerably higher; then when the stoker is at its best it is unfair to drop down on your curve and pick up hand fires, and make a comparison. The hand-firing is rather limited on account of the capacity of the fireman, and you must have a good grade of coal. Therefore, the comparison is not a fair one.

With reference to the air above the fire, as mentioned by Professor Endsley, we all know from practical experience that we do open the door, and a lot of us have had engines where it was absolutely necessary to open the door and to run with the door partly open for the full length of a division in order to get sufficient steam.

Mr. Chambers: I would like to qualify my remarks in view of what Mr. Kearney has stated about the amount of coal used in a stoker vs. hand-fired engine. I do not mean for a moment that an engine strictly within the limitations of firing by hand could be beaten or even approached by stoker firing, but I had in my mind possibly 50,000 tons tractive power as the dividing line for the application of a stoker. With a 50,000-ton locomotive or over I think we should approach, with proper supervision, just as economical operation with stoker firing as with hand-firing. The fact that it is not within the power of any one man to put coal in a firebox to meet emergencies by hand that he could with a stoker means that in order to foresee and take advantage of what is in front of him he naturally must be wasteful or otherwise fail to keep up steam.

Professor Endsley: I would like to ask Mr. Fuller whether if you had 10 openings the size of your door it would be a better job than to have it all go through the one door?

Mr. Fuller: I don't know. I haven't had the 10 openings.

Professor Endsley: Well, you could get the coal in. The necessity for getting it in there doesn't mean that you have to have a big door.

Mr. Fuller: It is not a large door. It is a door split in two, but it is convenient for the fireman because he just shovels the coal in. We have the open door with the baffle over the top of it. We use a peculiar grade of coal. It requires very little spreading, being so light. It has got to be handled very carefully because it is light, and at night it looks as if the engine was running with a wood fire, with a lot of sparks going out of the stack. It is a lignite coal.

Chairman Tollerton: I would like to hear from some of the Western railroads that have a lot of stokers.

John Purcell, (A. T. & St. Fe): We have about 135 locomotives equipped with stokers, all giving satisfactory service. We have increased our tonnage from 150 to 300 tons, and we feel that after the fireman has been educated to the stoker, that we are going to burn less coal than we burn by hand-firing, and for some six or eight months past we have been getting much better results.

Mr. W. J. Bohan (N. P.): We have about 20 engines equipped with stokers, and our experience with them has not been very long. Thus far, however, we have had good success with our stokers. They are on Mikado locomotives of approximately 57,000 lb. tractive effort. We are not in a position to go into detail as to loading of trains at this time, or as to how much coal, if any, can be saved by the use of the stoker.

Mr. Kearney: I think that Mr. Purcell has brought up an important point. He said that after his firemen are educated, he does not think stokers will use any more fuel than the hand-firing method. In that connection, we come back to the capacity of the fireman. If you are beyond the capacity of the fireman, you can't make a comparison, and if it is a blast and the coal is delivered to the firebox in a finely divided condition, you are going to use more coal. The percent of coal used increases almost in proportion to its fineness. That was worked out in some tests we made two or three years ago. With a heavy blast, the fuel is carried through more or less unconsumed and losses up to 30 or 35 percent are entirely possible.

M. H. Haig (Santa Fe): If I understand the comment of the last speaker, he is discriminating between the headwork of the fireman and the strength of his back. I notice that the committee made the statement that it was impressed by the replies of one railroad which said it could improve the quality of men employed as firemen.

The mechanical stoker of today has been developed to a remarkable degree but it will probably never reach a point beyond the control of the fireman. Economy in fuel consumption depends largely on the distribution of coal over the grate which in turn depends on the interest taken by the fireman. If the fireman will spend his time adjusting the stoker and watching his fire, so that he distributes the coal evenly and obtains a good fire, he will reach a terminal with a comparatively thin fire, and without an unnecessary amount of grate shaking on the road. The stoker has provided an opportunity to fire a large locomotive, increasing the tonnage and getting over the road in a limited time, but to accomplish this result it is necessary for the fireman to use his head, and I think that better results will be obtained and less coal used when the firemen have been better educated or trained.

R. P. Blake (N. P.). We have some stoker-fired locomotives on my division, using a semi-bituminous coal, which contains a good deal of sulphur and iron. With hand-fired locomotives and a fine grade of coal we used to experience a great deal of difficulty with clinkers in the fire, especially when they were not properly handled. Our experience with the stoker is that our engines using this coal have shown a very decided reduction in delays and troubles incident to cleaning fires on the road.

The education of firemen in operating stokers is an important subject and one that requires special consideration. The tendency to overload the firebox equipped with a stoker on account of the ease in feeding coal has been one of the drawbacks, but as firemen become familiar with the operation of the engine and the proper handling of fuel they can make a vast improvement in stoker performance.

Last November, during the coal strike, we had to use a considerable quantity of coal which had been in storage for a number of years, and the percentage of fine coal on the tenders as delivered from the docks was very great, frequently being 75 or 80 per cent. With the hand-fired locomotives it was extremely difficult to secure the average tonnage train performance, but with the stoker-fired locomotives we

were able to handle the full tonnage with a very low grade of fuel and get excellent results. The delays on the railroad cleaning fires were entirely eliminated with proper firing and the locomotive's performance was fully up to the average.

The education of the fireman is the most important feature in getting good results with the stoker fire, and the added fact that our stokers have a coal conveyor enabling us to use practically 75 per cent of the coal on the tender without shoveling it forward reduces the labor of the fireman. It also increases the tendency to use up the coal rather than to carry it around on the back of the tender. Our results with the stoker have been excellent so far, although we have only 7 engines in actual service now.

F. P. Roesch (Standard Stoker Company): Among reports received by the Fuel Conservation section of the Railroad Administration was one from a section in the cast where Pocahontas coal was used. They claimed that the spark losses ran as high as 40 per cent of the total amount of fuel introduced into the locomotive fire box. Now that is a rather high percentage, but in some further investigation that I made afterwards, I found that it was practically correct, and I believe you will find that the University of Illinois itself showed some 15 to 20 per cent, and on some Pennsylvania tests, it will run even higher.

In going around, trying to get some information on stoker operation, I ran across one gentleman who told me that in handling a very slack coal with one of the older type stokers, using the three distributors, he had reduced his spark loss from 20 to 30 per cent by discontinuing the use of the centre distributor. That was working along original lines, and if we carry it further, we will find that possibly the centre distributor was located a little bit too high, and that connected with it they had a low arch, and the heavy draft produced by the engineer dropping her down in a corner pulled the lighter stuff over the arch and out of the stack.

Any of you who are still using that type of stoker may be able to effect some economy, and at the same time please the brakeman on the rear of the train by cutting out the centre distributor. The man referred to claims that he got just as good results, so far as steam was concerned, and just as good fuel distribution.

Introduction of Air Above the Fire

Mr. Fuller made a point which I want to corroborate concerning the introduction of air above the fire. During the time I was connected with the Fuel Section, it was my privilege to ride on some of the locomotives on a subsidiary line, where they used a very light coal, practically a lignite. The only manner in which it differs from the lignite is that it hasn't the brown color. It is a grey, slack coal of 8,000 to 9,000 BTU. They fired it with a stoker, and with the door open using a baffle door. Strange to state, their coal consumption when figured on a cost per ton mile basis is lower than that obtained where a better grade of coal is being used.

Now, I agree with Professor Endsley that possibly better results might be obtained by dividing the air that passes above the fire into small streamlets, instead of introducing it as is done in connection with the baffle door. The air rushing into the baffle door acts as a distributor and spreads the coal where it is wanted.

As far as fuel economy is concerned, on the El Paso and Southwestern, we were obliged to reduce the tonnage upon the locomotive on account of the long gradients and the extremely hot weather.

I have a report now that since that time they have introduced stokers on this particular grade and increased the tonnage about 22 per cent with the same results as far as fuel consumption is concerned, figured on the thousand gross ton mile basis. When they go to the thousand gross ton mile per hour basis, however, they find that the fuel consumption has been reduced.

In the tests made at the Altoona testing plant, it was proven beyond the question of a doubt that when high rates of combustion were approached the stoker showed an economy over the best hand firing. At low rates of combustion, hand-firing showed an economy over the stoker.

H. C. Oviatt (New Haven): It does not appear that the question of fuel consumption or air admission to the firebox has very much to do with it. We never began to apply stokers to locomotives until we had produced locomotives where the rate of combustion was higher than the ordinary fireman could take care of. As a matter of fact, we bought locomotives in 1916 with 45,000 lb. tractive effort that have no stokers in them. And neither does it seem to me that the stoker is necessary if we can, by hand-firing, get the full efficiency of the locomotive. When we have reached the point where we cannot get the full efficiency by hand-firing, it stands to reason that we have got to have a mechanical device to put the coal into the firebox. At that point it is not a question of whether the stoker burns a little more coal than a smaller engine per ton mile worked by hand-firing. It is a question of how we are going to burn the coal in locomotives of more than 50,000 lb. tractive effort.

Locomotive Firemen

The question of the class of men we are securing today for locomotive firemen is most important. Years ago we could easily pick up a fellow who was anxious to get the job that paid that rate, even though he had to work hard. Today, while the rate is very attractive, the average young man with a high school education, is not inclined to accept that class of work on account of the labor involved. With a mechanical stoker, he is inclined to accept it because of the removal of this objection. The stoker, in my judgment, is approached from the angle of necessity on account of the heavy tractive effort and the desirability of securing better men for locomotive engineers and further promotion, due to the fact that we can get the better educated boys on account of the lesser manual labor connected with it.

As far as the air is concerned, it is very interesting to hear the remarks with reference to the air drawn in through the firebox door. I cannot see where the mechanical stoker has very much to do with it. If we provide openings in the ash pans, sufficient air for combustion can be drawn through the grates, pre-heating it, and we have not only improved the steaming qualities of the engine through better combustion, but also reduced the fuel consumption.

Educating the Engineman

W. L. Robinson (B. & O.): Several speakers have talked about some of the most important points of the stoker and, among other things, Mr. Roesch speaks of educating the engineer. This is very essential. Another feature in the reduction of fuel consumption is the selection of fuel. There has been a number of tests on the road with which I am connected, and also some further tests in the University of Illinois, under the jurisdiction of the International Railway Fuel Association. All of these tests have brought out comparisons relative to the physical characteristics of the coal.

In tests made on the Baltimore & Ohio several years ago, we found a 15 per cent difference between ¾ inch slack and 1½ inch slack from the same mine. We found much larger difference between low volatile coal and high volatile coal, and as the years have gone by it seems that we have had to take almost anything that would burn. When we talk of the stoker efficiency and the number of pounds of coal per thousand gross ton miles, I believe we will get nearer to a reduction in fuel consumption by a more careful selection and purchase of the fuel.

There have been many interruptions during the war, which resulted in the use of poor fuel, but now that we are going into the subject so extensively, it would seem that this body should exercise its influence toward inducing the management of the purchasing department in particular to do its very best to procure the proper kind of fuel. In other words, an economic size and kind of fuel should be purchased.

M. Flanagan (C. & O.): In view of the fact that there has been such a difference of opinion, particularly in regard to the introduction of air above the fire line, I feel I would like to give the experiences we have had on the C. & O. in connection with stoker-fired heavy Mikado engines.

We found that the fireman was a big factor in connection with the handling of this work. In fact, we found it was an impossibility to get uniform firing unless we had some way of governing or regulating the fireman, and in line with Professor

Endsley's idea, we have gradually opened up the nozzles on our engines until we had the engines so that they will not steam with a fire more than five or six inches thick, and the engines will steam perfectly when fired in that way.

We have 25 engines of this type operating on a crooked line with heavy tonnage, and they are almost perfect steamers. We have practically no trouble with them unless there is a defect in the way of a burst unit, or something of that kind, to cause trouble. There is no way of introducing air but at the fire line. In fact we have to open the firebox door when the engines sometimes get too hot and are popping off badly. I think the only solution of the problem is to draft your engines so they will not steam unless you fire them with a very light fire.

We had some complaints from our road foreman of engines when we first drafted them in that manner, from the fact that when the engine stopped—waiting for other trains to pass—the fireman would generally have to rebuild the fire to hold it. That difficulty, however, has not amounted to anything serious and we are still firing in that manner.

We have different kinds of coal screened at several points on the line at main coaling stations and large percentages of very fine slack are burned. Notwithstanding that condition, we have no trouble at all from bad steaming engines, and we load them to their full capacity practically all the time.

H. C. Manchester (D. L. & W.): I am here to get information on the stokers. We have not any at the present time, but if the dates of delivery which have been promised turn out to be correct, the first one will be running on the Lackawanna on July 1.

In thinking over the stoker proposition, this point occurred to me. In the last two years, we have used everything from soft coal up to run of mine anthracite, which comes in lumps as large as a half bushel basket. I was wondering what stoker would handle that best. (laughter). It has been necessary for us to do that on our road on account of the inability to get bituminous coal at any cost. We have not felt that a stoker would work out very well if those conditions should continue; however, we are going to have 10 engines equipped with stokers in July, and do the best we can with them.

I have heard a number of gentlemen in this discussion speak about educating the fireman, and someone spoke about educating the fellow on the other side. I do not believe, from what little I have learned about stokers, that you will relieve the engineer from the necessity of learning his part of the work if you are going to save fuel. I do not believe the stoker has revolutionized the locomotive to the point that the fireman can do it all. Out best success in bringing about fuel economy in the past has been from educating the engineer as well as the fireman.

We have heard the fuel conservation people talk about the great saving which can be brought about in the use of bituminous coal by wetting it, and thus avoiding it being blown off the tank by high winds. I would like to inquire if, in the use of stokers, you wet the coal; will the stoker handle wet coal?

We have on the Lackawanna Railroad a fuel instruction car, which is in operation all the time, for the purpose of instructing engineers and firemen on the proper handling of fuel. Our engineers as well as firemen will all be required to go into this car and get their instruction in operating stokers as soon as the stokers are put in service, and I want to get all the information I can to tell them how to do it.

The question of the use of anthracite coal in all sizes on 60 per cent of our locomotives, which we are having to do today on account of the inability to get soft coal, is the crux of the situation—will the stoker handle varying grades of anthracite coal from rice up to the largest sizes?

B. P. Flory (N. Y. O. & W.): I cannot give information as to what stokers will handle wet coal, but I can give information as to what stokers will not handle. We have 12 Santa Fe engines in service now practically for five years, originally equipped with a stoker not having a crusher. At the time these engines were put into operation we were able to purchase all the slack we needed. During the winter of 1917 and 1918, however, we could not get any slack and we had to break up the coal ourselves. At that time we were getting a number of different kinds of coal and the slack we made was very fine.

I remember one trip that I made on one of these engines. The coal was wet and had to be thawed out of the cars. When it got into the tank it was nearly frozen. The traveling fireman and myself were on the engine and the fireman was using his time to pick down the coal so that it would run into the conveyor and the traveling fireman and myself were pushing at the distributors all the time. That brings up the question of the use of coal crushers. It seems to me that a coal crusher is a thing one must have on the locomotive.

We are an anthracite coal road, and have been in the same state is Mr. Manchester, but we have been able to use bituminous coal on our stokers, with the exception of a few instances, when we used pea coal. The quality is not very good, and while the stoker handled it all right, we could not keep up all the steam we needed on the engines.

In the report submitted by the committee, one of the roads gave the answer that in the use of a stoker, the fireman can devote more time to improving himself in the necessary knowledge he requires to become an engineer. It is my idea that the fireman on a stoker engine, particularly on a road having grades, has got to devote all his time to running the stoker if he wants to keep a live fire, and handle it economically.

George L. Fowler (Con. Engr.): The matter of the temperature above the fire line has been brought up, and possibly a little experience I had a few years ago in making some firebox investigations, may be of interest. It shows the necessity of being careful as to the way in which air is admitted above the fire.

The investigation that I had in hand was the determination of the temperature of the two sides of the inside sheet, the fire side and the water side. I made my first determination back of the arch and there found about what I expected, that the fire side was considerably hotter than the water side.

Then I moved back beneath the arch over towards the back head, and to my astonishment I found the fire side of the sheet was 50 degrees colder than the water side. The boiler was one that was used in the Chicago district where the roads use four tubes expanded through the fire-box for steam jets for smoke prevention. I had taken these out to get them out of my way, and my first trial was about six inches ahead of one of these holes. The air was going into the hole gently, and turning and running around along the side of the sheet and keeping it cool. Simply blocking up that hole with a piece of asbestos, raised the temperature to where it ought to have been.

I found later, by putting the steam jet back and sending the air up at a velocity to get it away from the water and into the body of the fire before the air was burned, I had no such trouble in the cooling of the inside surface of the sheet.

I went into a nother place, 12 or 18 in. ahead of the side sheet, but flush with the door. Mr. Anthony, of the American Arch Co., read a paper before the New York Railroad Club, in which he made an estimate of what the temperature of that sheet ought to be, and his temperature agreed within 2 deg. F. with what I actually measured at that point. When the man opened the door, however, to fire the locomotive, the temperature of the sheet on the fire side dropped 150 deg. F. in less than 15 seconds, and I have never yet been able, as quickly as I could act, to catch the temperature of the sheet during the time that the man was opening the door. The simple matter of swinging the door was throwing so much cool air up against the side sheets that the temperature fell so rapidly that no instrument I could get would keep up with it. It would balance in a few seconds, but at the time the fire door was wide open the temperature was below anything I could measure.

In firing the boiler I also found the expansion of the tubes pushed the back tube sheet back slowly until it moved quite a measurable distance in comparison with the shell of the boiler. Then when the throttle was opened the fire burned very rapidly, and within a very few seconds the sheet moved back half as far again as it was moved during the whole period of firing up.

If you open the fire door under those conditions, the tube sheet shoots ahead as if it was shot out of a gun, and by careful manipulation of the back fire door and throttle you can move the tube sheet backwards and forwards, as you

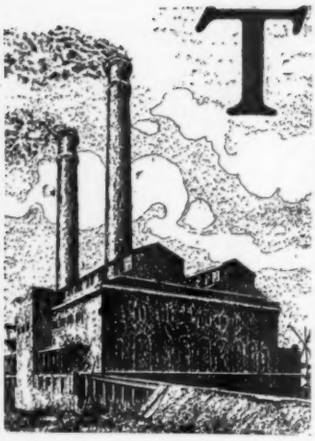
would a bellows. So this matter of the admisison of air to the firebox may improve combustion, but unless it is done very carefully, it may have a very detrimental effect on the expansion stresses in the sheets of the boiler.

Chairman Tollerton: I dislike to shut off any additional discussion on this important subject, but all the time allotted for the discussion of this paper has elapsed and a motion that the report of the committee be received or ordered printed and the committee continued will be in order.

C. E. Chambers: I so move.

(*The motion was duly seconded and was then put to vote, and carried.*)

Modernization of Stationary Boiler Plants



THE TOTAL QUANTITY OF FUEL used in stationary plants amounts to about 40 per cent of the country's total consumption, or in round numbers 225,000,000 tons, which is a quantity greater by about 15 per cent than the total used for locomotive purposes. It is apparent, therefore, that large possibilities for economy rest with those who supervise the use of fuel for stationary purposes, and it is fair to presume that the opportunities for such economy are relatively much greater on the average railroad than in industrial or commercial car plants, where the cost of operation may be a vital factor in the selling price of a product.

Even under the most favorable conditions, there are large unpreventable losses, but they are insignificant compared with those most readily prevented. Of the preventable losses, those encountered between the coal pile and the boiler exceed all the preventable waste between the boiler and the machinery, and of such losses by far the greater proportion are found in the furnace. The problem of modernization, therefore, concerns the extent and character of the preventable losses occurring under daily operating conditions.

Performance of Existing Plants

In order that some convenient basis of judging boiler performance might be available for reference, the committee decided that an approximate standard should be established as a guide to results, below which the efficiency could be regarded as unreasonably low, and above which excellent practical results were still obtainable. It should, however, be observed that peculiar conditions may exist on the various railroads that must be analyzed before judgment is rendered as to the performance of any plant.

Every railroad has a number of points where only a small quantity of steam or low pressure steam is required. These plants are usually for pumping or heating purposes. On account of this class of service being intermittent or seasonal the operator is usually a "coal shoveler" and not an economical fireman. For this reason, economy in operation is not the foremost point to be considered. Capacity, safety and cost of installation are of the most importance in such cases. Safety is a major factor, because such boilers do not receive the constant attention of an intelligent operator, who would wash them and fire them with a view to greater economy. Larger boilers than would ordinarily be required are installed at these points because the rates of evaporation are very low, due to scale formation, soot coatings, poor firing and steam wastes. Recognition of the existence of these wastes is rapidly causing the renewal of the boilers and the installation of motors or gas engines in many of our pumping plants.

Vertical, tubular and locomotive type boilers have formed a larger percentage of the boilers at places where the steam requirements were small or intermittent. The boilers from scrapped locomotives have formed a large proportion of such power generators. Because of the expensive settings, both the return tubular and the water tube types of boilers costs about three times as much to install as the self-contained locomotive type.

There are, however, perhaps 10 to 30 per cent of railroad stationary boilers installed in the better power houses that are operating under conditions favorable to the higher economies characteristic of the best modern practice. Such plants can be placed upon a basis of maximum economical power production with a relatively limited expenditure, and it should be recalled that economy in boiler operation is synonymous with increased capacity. The efficiency of any boiler plant is dependent upon a number of variables, such as the load carried, the coal and water used, the character of equipment, and the method of operation, so that each plant has its own particular ratings, but it is posible to establish a set of averages fairly representative of good practice. Such a set of averages is shown in the accompanying table for the different types of boilers in most general use, and from this table the curves in Fig. 1 have been developed.

With a given boiler plant, the first step preliminary to any improvements, is an analysis of present performance. This can be most readily made by obtaining the quantity of coal

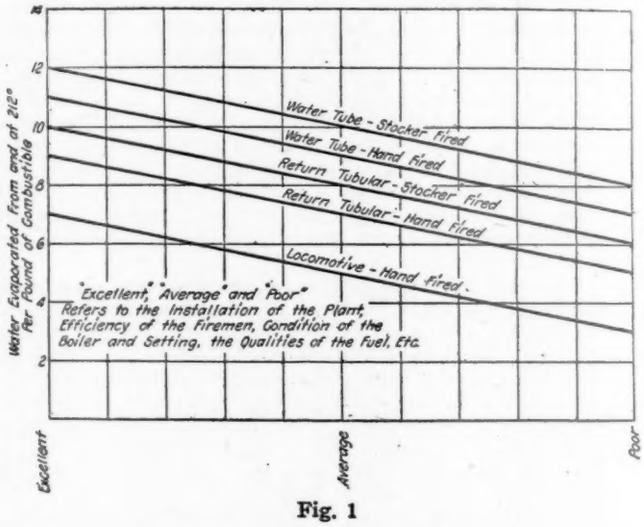

Water Evaporated From and at 212° Per Pound of Combustible
12
10
8
6
4
2
Water Tube - Stocker Fired
Water Tube - Hand Fired
Return Tubular - Stocker Fired
Return Tubular - Hand Fired
Locomotive - Hand Fired
"Excellent," "Average" and "Poor"
Refers to the Installation of the Plant, Efficiency of the Firemen, Condition of the Boiler and Setting, the Qualities of the Fuel, Etc.
Excellent
Average
Poor

Fig. 1

burned and the corresponding quantity of water evaporated. As shown by the curves mentioned, the results expressed in the proper terms should not be less than indicated in the following table for the types of boiler specified:

Type if boiler	Evaporation from and at 212° per lb. of combustible
Water tube—stoker fired	10 lb.
Water tube—hand fired	9 lb.
Return tubular—stoker fired	8 lb.
Return tubular—hand fired	7 lb.
Locomotive—hand fired	5 lb.

If lower results are obtained, a check of plant conditions should be instituted to determine the nature and extent of the losses. These may arise through one or more of the following causes: (1) Excess air, (2) air leakage, (3) incomplete combustion, (4) short circuit in gas passages, (5) leakage of water and steam, (6) friction and radiation in steam pipes, (7) incorrect corelation of load and draft, (8) soot on heating surfaces, (9) scale in boiler, (10) heating moisture in coal, and (11) radiation.

In analyzing the boiler performance with a view to minimizing the losses, certain apparatus will be required that should be made a part of the regular plant equipment. It is useless to establish a set of ideal conditions and then remove the means through which these conditions were formed. The

first and most important items are the following: (1) differential draft gages for each boiler, (2) two good thermometers reading up to 300 deg., and (3) a simple CO_2 apparatus. With this equipment it is possible to determine the extent of the losses occasioned through excess air, these being by far the most serious of all in the average plant. Any expenditure made for the elimination of air leakage will soon pay for itself.

Leaks through the setting should be stopped with asbestos or front end cement and should be caulked with asbestos fibre proper and thorough use of such blowers, and the committee favors the application of soot blowers designed for permanent attachment to the boilers.

Scale is formed from the evaporation of practically all water supplies for boiler feed purposes. Scale varying in thickness up to ⅛ in. may cause heat losses as high as 10 per cent.

The losses due to moisture in the coal vary directly with the percentage of moisture, an increase of 10 per cent representing an over all loss of about four per cent in efficiency. This loss increases much faster with the lower percentages of moisture.

STEAM BOILER PERFORMANCE DATA

Type of boiler	Builder's rating, h.p.	Percentage of rating developed	Method of firing	Kind of coal	Grate surface sq. ft.	Ratio of heating surface to grate area	Coal burned per sq. ft. of grate per hour	Apparent evaporation per lb. of coal as fired	Equiv. evaporation per lb. of combustible	Equiv. Evap. per sq. ft. of heating surface per hour	Combined efficiency of boiler and grate
Water tube	250	100	Hand.	No. 2 Wash. bit.	48	52	24	6.68	8.28	3.50	....
R. T.	100	108	Chain grate.	Semi-bit.	20	50	19.2	8.92	11.40	3.10	76
R. T.	100	275	Chain grate.	Semi-bit.	20	50	55	7.67	9.68	9.86	64
R. T.	150	124	Hand.	S. B.	39	46	20.1	7.8	9	4.48	60
R. T.	150	135	Chain grate.	Semi-bit.	35	51.5	18	10.56	12	4.81	80
R. T.	200	122	Hand.	S. B.	39	59	20.5	9.35	11.67	3.40	70.2
Vertical water tube...	350	98	Chain grate.	No. 3 Wash. bit.	32.5	42.5	17	8.2	11.7	3.4	70.2
Vertical tube	40	95	Hand.	Poca.	9.5	52.2	13.7	8.36	10.2	2.8	63.5
Hor. water tube	107	130	Hand.	Poca.	25	42.8	20.1	10.48	12.33	4.31	73.8
Hor. water tube	231	173	Hand.	No. 3 buck.	....	59.5	31.8	9.25	10.29	5.98	71
Hor. water tube	...	109	Hand.	No. 3 buck.	....	35.9	16.1	8.37	11.99	3.74	68.8
Hor. water tube	250	186	Hand.	Anth. pea	56	41.5	9.8	10.40	13.20	2.60	....
Water tube	412	105	Overfeed inclined stoker.	New river	74.8	35	21	9.68	12.4	3.6	74.9
Water tube	500	220	Chain.	No. 4 bit.	90	55.6	43.2	7.8	11.8	7.59	72
Hor. water tube	600	188	Underfeed stoker.	Clearfield R. M.	92	66.5	42.5	8.14	11.6	6.36	71.3
Hor. water tube	300 h.p.	206.65%	Chain grate.	12,700 B. T. W.	64	46.8	40.13#	7.25	8.164	6.79	58.12%
Hor. water tube	300 h.p.	198½%	Chain grate.	12,517 B. T. W.	64	46.8	41.5#	7.746	8.888	6.86	60%

soaked with fire clay. The setting may be tested for leaks by building a smoky fire and shutting the damper. Finally, some commercial flexible coating should be applied over the entire setting.

After the setting has been made tight, the relation between the required evaporation, the depth of the fuel, the draft and the air required should be determined for each grade of fuel used. Tests should be made at different boiler loads, and simultaneous observations made of the thickness of fuel bed, the draft and the amount of CO_2.

It will be found that with a given thickness of fuel bed, a certain draft will give a maximum CO_2 reading. A table compiled from the observations will show the fireman what damper opening and what thickness of fire should correspond with a given draft gage reading. The draft should be controlled by means of dampers in the flue and not in the ashpit doors. Where there are a number of boilers, the individual dampers should be adjusted so that each boiler will carry its proportion of the load under the most economical draft, and the draft increased with changing loads through the use of a damper in the main flue.

The loss due to incomplete combustion is probably not one-tenth that caused by excess air. It should be observed also that smoke is not necessarily an indication of the extent of this loss, since it arises from the emission of carbon monoxide, a colorless gas. This gas is highly combustible and has a heat value of 10,000 B. t. u. per pound. Its formation is due to (1) furnaces of poor design, (2) improper methods of firing, (3) improper mixing of the combustible gases with the air, (4) low furnace temperatures, so that the gases are cooled below the ignition point, and (5) deficient air supply.

Generally, incomplete combustion is due to deficient air supply caused by improper grate openings, by too little draft or by the formation of clinker over the fuel bed. Any CO_2 reading above 10 per cent warrants a check for the determination of CO (carbon monoxide) which may result in a two per cent loss for each one per cent of CO.

Short circuits in gas passages are preventable through proper inspection and repair. They occur most frequently in boilers having interior baffling, such as the water tube types.

Leakage of water and steam constitutes a large element of waste in railroad power plants. A 3/16-in. opening in a line carrying 100 lb. pressure will result in a coal and water loss aggregating about $400 per month.

Soot is one of the best non-conductors of heat yet discovered. Thickness for thickness, soot will stop five times as much heat as fine asbestos and may involve a loss of as much as seven per cent. The best and most effective means of removing soot is by the use of a hand blower, but it is usually difficult to insure the

It is important, therefore, that water be used sparingly on coal to keep down dust in the boiler room.

Radiation losses are easy to locate and remedy. Surfaces that are too hot to touch without discomfort represent a serious loss of heat. A one inch layer of good commercial covering will prevent the escape of 75 to 85 per cent of the heat lost from bare surfaces.

Reduced efficiency, from whatever cause, is likely to be reflected in increased flue gas temperatures, because of the necessity for increasing the rate of combustion. For plants operating on natural draft, a temperature of about 500 deg. F. is required in the stack to produce the necessary draft to operate the boilers at their normal capacity. An average temperature of 550 deg. may, therefore, be regarded as good practice. This will increase with the rate of evaporation in the same boiler, and for 250 per cent of rating may reach 560 deg. and still be within the limit of good practice. For forced drafts in four-pass boilers and exceptionally efficient operation, temperatures considerably lower than those mentioned may frequently be attained.

Abnormally high flue gas temperatures will result from (1) leaking baffles, (2) unclean water and heating surface, (3) excessive deposit of soot upon the tubes, (4) draft greater than necessary for the load, (5) insufficient heating surface per unit of stoker or grate, and (6) improper methods of operation resulting in secondary combustion.

Boiler Room Equipment

Feed water heaters produce greater economy than any other auxiliary boiler room equipment. For every 11 deg. rise in feed water temperature one per cent saving is made in fuel. The preheating of feed water also increases the steaming capacity of the boiler, reduces trouble from leaky tubes and cracked sheets, and decreases scale deposits on the heating surfaces.

The committee prefers the open type heater because it requires less maintenance and permits the precipitation of much scale forming material before entering the boiler.

Feed pumps are preferable to injectors on all except small upright boilers. Injectors do not permit preheating the feed water, consequently relatively cold water is introduced into the boilers.

The results obtained from any boiler plant are not due to the character or excellence of equipment. It is a matter of the proper use of equipment and, therefore, one involving the human element. In the larger plants it is not now unusual to establish the most efficient operation through proper study and then insure maximum operating efficiency by a system of bonus payments dependent upon the savings produced. For the average railroad boiler plant the introduction of such a system is probably not

feasible, but it is possible to establish practical methods of checking the work of the boiler room force in order that the most apparent of wasteful practices may be prevented.

SUMMARY

The conclusions of the committee as to existing plants may be summarized as follows:

1. Eliminate air infiltration in settings by plugging cracks and applying a commercial boiler seal.
2. Apply adjustable dampers in the uptake of each boiler to permit draft control.
3. Apply a differential draft gage to each boiler.
4. Institute a system of periodical inspection of grates, brick walls and baffles.
5. Install automatic soot blowers in return tubular and water tube boilers.
6. Analyze the feed water to determine the amount of scale forming ingredients, and purchase a suitable treating compound based on guaranteed savings. Don't use a "cure all" compound.
7. Cover all exposed surfaces with a good commercial insulation.
8. Install feed water heaters in all plants of 100 hp. or over.
9. Use pumps, preferably outside packed plunger type, for boiler feed purposes.
10. See that the boiler room force is instructed in the proper operation of the equipment and follow up the instructions by periodical check observations.
11. Employ only competent, intelligent firemen.

Stokers

A vast amount of detailed information has been received, both from the committee members and from the various stoker and grate manufacturers, in regard to the principal characteristics of the various types of stokers. It is necessary to know all of the conditions in order to select the best type of stoker for the purpose in mind. Probably the most important feature is the characteristics of the fuel available as well as the size of the plant to be constructed or to which the stoker is to be applied.

In general, the underfeed type of stoker is better adapted to secure larger overload capacities from the boilers to which it is applied than any other, as well as being better able to produce flexibility of operation in falling peak loads on a boiler plant. This type of stoker, however, does not operate satisfactorily on all grades of fuel, being better adapted to the Eastern grades of coking coal having high ash fusing temperatures. Where the fuel supply makes it inadvisable to use this type of stoker, it would seem that the overfeed or chain grate types would be the best form of stoker to adopt. The overfeed type burning coking coal is of better advantage than the chain grate type.

While it is true that the installation of either overfeed or chain grate type of stokers can probably be made at less expense than that of the underfeed, it must be considered in this connection that the higher boiler rating obtainable with the underfeed stoker permits economies in capital outlay and construction cost in the boiler installation, so that the total expense of the boiler and stoker installation must be considered when comparisons are made between installation costs. The overall operating costs, when the efficiencies of the two types of stokers and their boilers are considered, would probably not be very different for any given installation.

Piping

It is important from the standpoint of economical operation that all power-plant steam piping systems should be as simple as possible, free from unnecessary bends and fittings, and laid out to secure the shortest direct routes between boilers, engines and other apparatus.

All branch lines should be provided with valves, in order that those not required for use may be cut off from the main line, thereby avoiding loss through condensation and leakage. Suitable drips should be provided for each high-pressure header and for steam separators, if used; the hot water from these drips being returned to the feed water heater.

The size and length of steam and exhaust mains will directly affect the fuel consumption. If the steam main between the boilers and prime movers is too small, or too long, it will necessitate carrying a much higher boiler pressure than would otherwise be necessary in order that the required pressure may be obtained at the engine. The drop in pressure between the boiler and throttle of any of the prime movers should not be greater than five points when the prime mover is operated at full capacity.

It is obvious that if higher pressure is necessary to overcome loss on account of improper design, there will be a corresponding loss of plant capacity, or what is the same thing, an unnecessary increase in consumption of coal and water. If the steam mains are larger than necessary, there may be no loss in pressure, but there will be a heat loss and an increase in cost of installation and maintenance.

Design of exhaust steam lines is extremely important, because it is essential that the exhaust steam be discharged at the lowest possible back pressure. In general, the pressure on exhaust steam lines should not exceed two pounds.

Pipe Covering

In the past, the railroads have paid too little attention to steam pipe insulation in respect both to material and workmanship. In most cases it pays to use the best quality of commercial pipe covering available, and the element of first cost is comparatively unimportant when the possible economies are so large.

As a guide to the selection of the most suitable and efficient covering some fundamental principles may be established. The first consideration must be that relating to any particular service condition, such as the probable influence of moisture from steam leaks, submersion, or exposure to the weather, the effects of vibration, the desirability of re-use, the necessity for repeated renewals, etc. These are features of the problems requiring specific treatment to suit the special conditions as they rise. The following recommendations are, therefore, applicable only to interior power plants, or shop piping.

The requirements for a good covering may be summarized as follows: (1) High non-conducting properties; (2) fireproof; (3) easily molded and light in weight; (4) impervious to moisture; (5) insoluble; (6) unaffected by steam; (7) non-corrosive; (8) structurally strong to resist handling and vibration, and (9) sanitary and vermin proof.

Most of the commercial brands of coverings will satisfy these specifications, but they differ considerably in insulating efficiency. Thickness for thickness, maximum insulating value can be obtained from the so-called felted asbestos coverings, while 85 per cent magnesia yields only slightly less favorable results at some saving in original cost.

Power Plants for Terminals and Shops

The design, installation and operation of a railroad stationary power plant requires considerable study, as it depends on many things to make it meet the needs for continuous and economical service.

Railroad stationary plants, from 500 boiler hp. to 3,000 boiler hp., may be of the same general design, using the same type of boiler. The smaller size plants, however, can not afford as many labor saving devices as the larger plants, but plants of the above mentioned ratings can all well afford the installation of stokers. The upkeep cost for stokers will, in general, be higher than for handfired furnaces, but stokers make possible the use of cheaper fuels with as high or higher economy than is obtainable with hand-fired furnaces using a better grade of fuel, and when used with a properly designed combustion chamber, not only serve as a labor saving device, but make it possible to obtain higher boiler ratings than can be obtained by ordinary hand firing.

The type of stoker is determined to a great extent by the available coal supply. Underfeed stokers have proved in most cases to be more desirable for the average run of bituminous coal. Chain-grate stokers with forced draft operate satisfactorily with various kinds of fine fuel, such as anthracite screenings, anthracite and bituminous mixtures, culm, etc., and, recently successful installations have been made for low-grade fuels, such as bituminous coals high in ash and lignites with excessive moisture.

Scarcity of labor has brought about the installation of many labor saving devices in the power plant. The instal-

lation of coal and ash handling equipment and mechanical soot blowers are of great importance from the standpoint of both economy and labor saving.

In selecting the location for the railroad power plant, there are three important factors that should govern: (1) The plant should be located as near as possible to the center of distribution of the load it is to supply; (2) a siding should be provided close to the boiler room so that coal and ash cars can be so placed that long haulage and extra handling of coal and ashes will be cut to a minimum; and (3) sufficient space for additional expansion should be provided.

The plant should be simple in construction and so planned that all unnecessary space is eliminated. Economy in the use of construction material can be secured by careful study of design. Unnecessary depths below ground should give way to more logical design. A large factor in economy can also be obtained by the combination of the coal bunker and roof support.

The boiler settings should be given careful study and if a hand-fired installation is being made, provision should be made to permit a future increase in the boiler capacity, which often becomes desirable, by applying stokers and increasing the height of the boiler settings to obtain the larger combustion chamber desirable in a stoker installation. Sufficient head room provided to meet this expansion means a considerable saving of both time and money, which would be involved if the higher boiler settings necessitated the raising of the boiler room roof, or the lowering of the boiler room floor to obtain the required space. It is well to remember, in designing the boiler room, that the boilers should not only have clearance for firing and withdrawing tubes, but room to inspect and repair the setting, piping and accessories. Platforms and stairways for convenience of operating valves, etc., should be especially considered in this connection.

The steam piping of a plant, as well as the yard lines of distribution, should receive careful consideration. Poor piping layout is very often the cause of water pocketing in certain parts of the piping. The pitch of all pipe should be in the direction of the flow of steam and the piping should be so arranged as to insure quick and easy repairs to the lines.

All steam lines should be well lagged to reduce the heat losses to a minimum. It is just as important to provide lagging for the piping as it is to provide pipe gaskets and proper pipe joints. Yard, steam and air distribution lines should, wherever possible, be carried above ground so that inspection and proper maintenance can be assured.

Many of the inefficient and obselete types of railroad stationary plants were created without any real study or engineering being applied to their installation. This has usually been the result of allowing the local operating force to design and install the plant more with the end in view of obtaining quick relief in an emergency than of providing satisfactory designs.

In order to determine the proper recommendations for the design and installation of power plants for roundhouse and repair shops of varying capacities, it would be well to outline just what equipment has been installed in a successful, economical and desirable installation of a railroad stationary plant of 1,500 to 2,500 boiler hp. rating, depending upon the grade of coal available and the type of stoker used.

[The committee gave in detail a list of the power requirements and plant equipment for a terminal handling 3,400 locomotives a month and 1,025 freight cars a month for all classes of repairs. Some of the recommendations follow.—Editor]

The following boiler room instruments should be supplied when deemed advisable, in the order shown: (1) feed water meter, (2) coal weighing device, (3) recording steam pressure gage, (4) draft gages, (5) breeching and stack thermometers, (6) steam flow meters, and (7) CO_2 indicator.

Superheaters are recommended for plants having turbine installations.

Economizers are not recommended because they require considerably more space than a heater of the exhaust type; additional brickwork is required, increasing the cost and maintenance, and cleaning scale and soot from economizers requires considerable expense and throws the economizers out of service during an excessive portion of the time. It is possible, however, that where coal is high in price, the saving obtained by the use of economizers might offset its expense of operation and warrant its installation.

Air compressors of the two-stage, engine-driven type are recommended. Where current is available and the distance to the air load center from the plant is great, the use of a motor driven air compressor near the center of the load is often very desirable and economical.

Special Method of Combustion

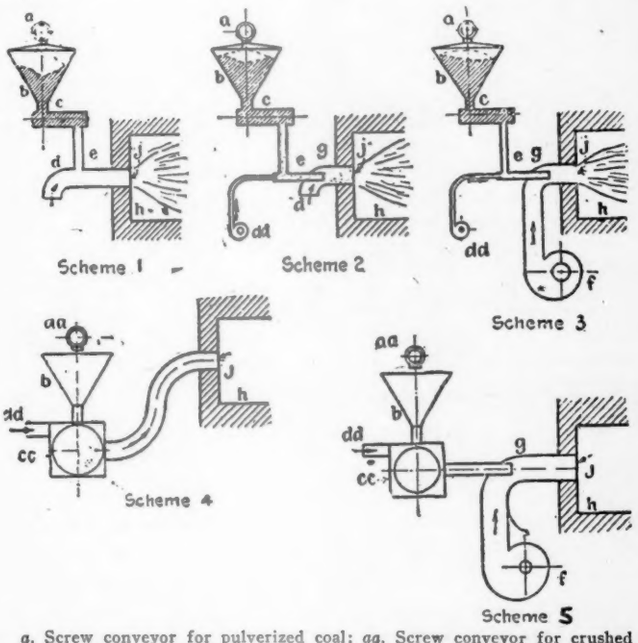
Pulverized Fuel

The Fuller Engineering Company, in a bulletin published in 1918, gave the annual consumption of powdered coal as follows:

In the manufacture of cement	6,000,000 tons
In the iron and steel industry	2,000,000 tons
In the production of copper	1,500,000 tons
In the generation of power	100,000 to 200,000 tons

The use of pulverized fuel for stationary boilers can still be considered in the experimental stage and therefore the available data of any reliability on the subject is meager.

Preparation of Pulverized Coal.—In general, the systems of preparing pulverized coal for fuel in stationary plants can be divided into two methods: (1) where coal is prepared at the same rate that it is consumed in the furnace, and (2) where sufficient storage capacity is provided so that a 24-hr. run of coal for the boilers may be pulverized in say 8 to 10 hours. Under the latter method, the pulverized coal is stored in a dust proof hopper, usually at the front of the boilers from which it is fed directly to the burners and thence to the boilers.



a, Screw conveyor for pulverized coal; *aa*, Screw conveyor for crushed coal; *b*, Hopper; *c*, Feeding device; *cc*, Self-contained pulverizing, mixing and feeding machine; *d*, Induced-draft combustion air; *dd*, Primary mixing air blower; *e*, Primary mixing chamber; *f*, Secondary air blower; *g*, Secondary mixing chamber; *h*, Hearth; *j*, Nozzle. The delivery outlet or outlets are arranged and shaped to suit the hearth, which in turn depends on the nature of the service.

Fig. 2.—Pulverized Coal Feeding Devices

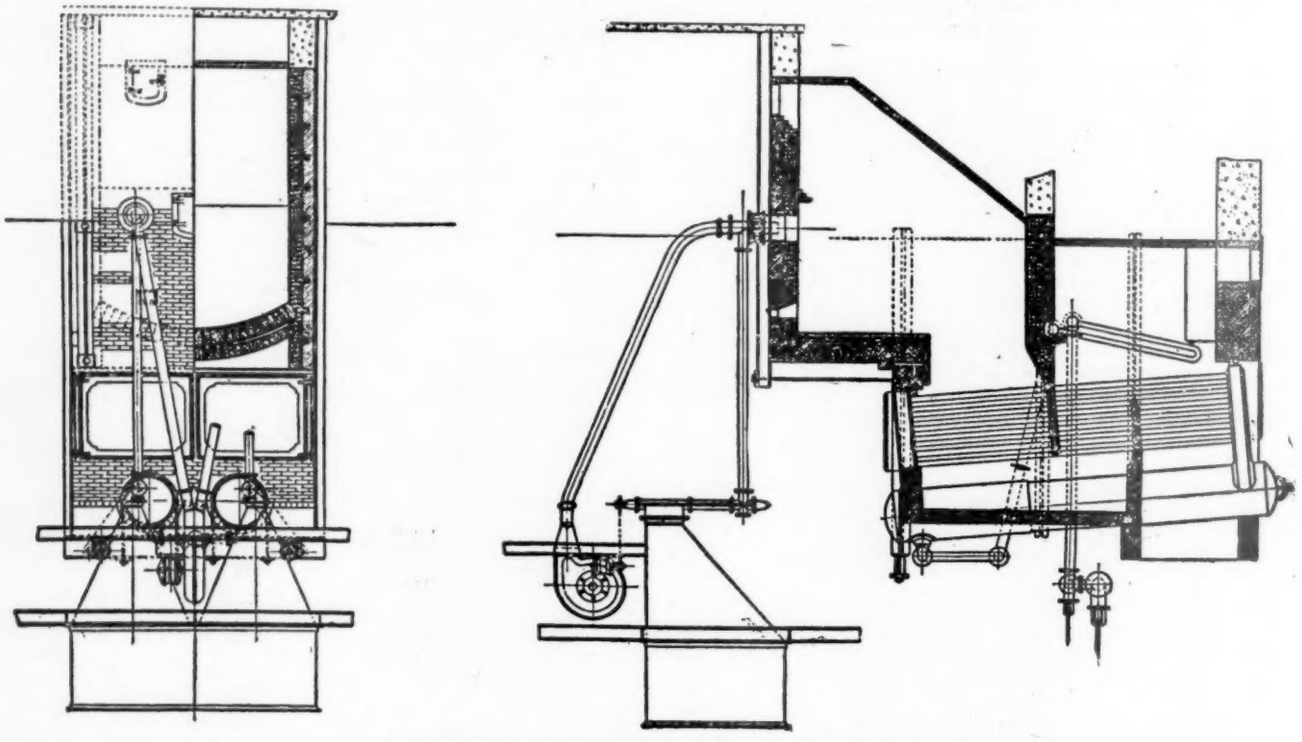
In modern pulverizing plants, the amount of conveying done is small, for it is always desirable to make the entire plant as integral as possible. The conveying system from car to dryers is much the same as that used in modern stoker-fired plants. However, after pulverized coal leaves the pulverizing mill, it must be handled in dust tight conveyors. Screw conveyors have been very extensively used for this purpose, although recently one of the pulverized coal equipment companies has designed and used a pulverized coal "pump." This "pump" consists of a short screw conveyor, motor driven at 750 r. p. m., discharging the coal through a nozzled opening into a dust tight pipe. In this nozzle is introduced compressed air (3 cu. ft. of free air per cu. ft. of coal), which carries the coal through the pipe to

its several points of distribution. The air is used merely to aerate the coal, the screw conveyor doing the actual conveying.

Storage of large quantities of pulverized coal is not to be looked upon as good practice. Large quantities of pulverized coal collect moisture most readily and involve some slight hazard of explosion.

Arrangement of Burners.—There are several types of burners on the market today, all of which have about the same claim to merit. But the various arrangements in use are well illustrated in Fig. 2, taken from paper on "Pulverized Coal as a Fuel for Boilers," by E. R. Wells and W. H. Jacobi, of the J. G. White Engineering Corporation. (Presented before the A. S. M. E., see Mechanical Engineering, September, 1919.)

Scheme (1) depends entirely on induced chimney draft for



Designed by Fuller Engineering Company, Allentown, Pa.

From "Pulverized Coal for Stationary Boilers." By F. A. Scheffler and H. G. Barnhurst, Fuller Engineering Co., before A. S. M. E.

Fig. 3.—425 H. P. Heine Boiler Arranged for Pulverized Coal Firing

air supply. Scheme (2) is a combination of natural and forced draft. Scheme (3) provides a full control of fuel and air. In schemes (4) and (5) self contained pulverizing units are employed.

Furnaces.—As in the case of burning solid coal on grates, the proper design of furnace is of prime importance. Great difficulty will be experienced with slagging if the brick work is too close to the deflagration zone. The quality of coal used will largely dictate the furnace design.

All authorities seem agreed upon the statement that low gas velocities are desirable. This is dependent somewhat upon the velocity at which the coal and air is fed to the furnace. A high velocity of fuel injection into the furnace tends to carry the deflagration zone too near the tubes, causing considerable trouble with slag formations on the tubes. On the other hand, if the velocity is not sufficient to carry the flame forward and away from the burner, difficulty with back-firing will be experienced.

Fig. 3 shows a typical furnace design with a Heine boiler.

Minimum Size of Boiler Plant for the Economical use of Pulverized Coal.—It is doubtful whether a plant that could not economically install and operate mechanical stokers, could afford the expense of installing and operating a pulverized coal plant. John Anderson, chief engineer of power plants, the Milwaukee Electric Railway & Light Company, in his article, "Use of Pulverized Fuel Under Central Station Boilers (see Tech. League, E. M. B. A., Milwaukee, February, 1920), states: "A plant of less than 2,500 developed boiler horse-power on a 24-hr. operating basis should not consider using powdered fuel."

Coal Suitable for Pulverizing.—Practically any grade of coal can be pulverized, although the harder anthracites and coke, are very severe on the mills. Bituminous lends itself very readily to pulverizing, and N. C. Harrison (see Mechanical Engineering, August, 1919) states: "Coals with less than 10 per cent ash, volatile averaging between 30 and 40 per cent, and fixed carbon between 40 and 50 per cent, low sulphur content, and high fusion point of ash, are in general the most satisfactory coals."

All authorities are not agreed as to just how much effect high sulphur content has in the burning of pulverized coal. Moisture in the coal is objectionable, not so much because of the thermal losses as because of the difficulty and increased cost of pulverizing. However, uniform quality of coal, as well as uniformity of fineness, is highly desirable.

Cost of Pulverizing Coal.—In "Pulverized Coal for Stationary Plants," by F. A. Scheffler and H. G. Barnhurst of the Fuller Engineering Co., (see Mechanical Engineering, August, 1919), the cost of delivering pulverized fuel to the boilers is given in the following table:

	Dollars per net ton	
	100-ton plant	1,000-ton plant
Power at ¼ cent per kw.-hr. and 17 kw. hrs	$0.1275	$0.1275
Labor at 40 cents per hr	0.14	0.04
Drier Coal at $5.00 per ton, delivered	0.06	0.06
Repairs	0.07	0.07
Total actual cost of pulverizing, per net ton	$0.3975	$0.2975
Interest at 6 per cent	0.105	0.039
Depreciation	0.12	0.04
Taxes and insurance	0.035	0.013
Total cost per net ton	$0.6575	$0.3895

Tests with Pulverized Coal as a Boiler Fuel.—The table on the following page gives results on a few tests that have been reported recently with pulverized coal under stationary boilers.

Pulverized Coal vs. Mechanical Stokers.—The most modern pulverized coal burning plants have been in operation such a comparatively short length of time that standards have not yet been satisfactorily worked out, and the data available is not sufficient that any definite conclusions can be based on it. How-

ever, the following figures will give some idea of the comparative results obtained with modern pulverized coal burning plants and mechanical stoker-fired plants. The table is taken directly from John Anderson's paper, to which reference has already been made. The modern stoker plant herein compared is the stoker formerly used at this plant, and is of the forced draft, multiple retort underfeed type. The figures are based one ton of coal burned:

TESTS WITH PULVERIZED COAL UNDER STATIONARY BOILERS

Manufacturer	Hp.	Boilers Per cent rating	Kind of coal	Duration test hrs.	Boiler and furnace efficiency Gross	Net
Edge Moor..	468	118.4	50 per cent Youghiogheny screenings. 50 per cent East Kentucky, 12,810 B. t. u. dry.....	99	80.67	72.32
Heine	370	95.0	Kansas bituminous, 11,435 B. t. u. as fired	25 days	78.1	
B. & W.	600	126.0	Issaquah screenings, 11,660 B. t. u. as fired	24	78.95	.....
Stirling	439	155.0	Gallup, N. M., 10,680 B. t. u. as fired	6 days	79.5	.....
Edge Moor ..	468	116.7	Bituminous screenings	24	85.22	81.1

NOTE.—Net efficiencies are equal to gross efficiencies less deductions for fuel preparation.

	Pulv. fuel system	Modern stoker
Energy consumed by conveyors, crusher, elevators, driers, fans and feeders or stokers and blowers, kw. hrs.	5.73	10.94
Energy consumed by pulverizer, kw. hrs.	16.72	.....
Total energy, kw. hrs.	22.45	10.94
Coal equivalent at 1.5 lb. per kw. hr., lb.	33.68	16.41
Coal consumed in drier furnace, lb.	25.66	.....
Total coal and equivalent, lb.	59.34	16.41
Cost of Fuel Preparation, Firing and Ash Disposal		
Labor—coal preparation	$0.143	$0.000
Labor—firing	.112	.140
Labor—ash removal (in plant)	.025	.064
Dryer fuel—coal at $4.00 per ton.	.051	.000
Electrical energy—coal per kw. hr. at 1.5 lb.	.069	.033
Maintenance		
Labor at 3.6 cents (material at 2 cents, mf'gs. est. lubricants at 0.7 cents.	0.063	0.007*
Total cost of fuel preparation, firing, ash disposal and maintenance	.462	.334
Price of coal as purchased, per ton.	4.000	4.000
Total cost per ton.	4.462	4.334
Cost per ton of coal in pulv. fuel system over modern stoker	0.128	.....
Efficiency		
Actual gross efficiency, per cent.	80.67	76.80
Net efficiency after all incidental costs have been accounted for, per cent.	72.32	70.88
Difference in favor of pulverized fuel system, per cent.	1.44	.....

* Labor, 4.6 cents; material, 4.9 cents, and lubricants, .2 cents.

It is to be noted that the actual increase of efficiency (net) of pulverized fuel burners over modern stokers is less than 1.5 per cent.

Combustion of Pulverized Coal.—The following table is taken from "Pulverized Coal as a Fuel for Boilers," by E. R. Welles and W. H. Jacobi (see Mech. Engineer, September, 1919), and shows the relation between CO_2, excess air and furnace temperature:

Percentage of excess air	0	25	50	75	100	125
Combustion temperature, deg. F., carbon	4,000	3,450	3,000	2,625	2,350	....
Average bituminous coal.	4,860	4,000	3,325	2,860	2,500	2,220
CO_2, per cent.	20.8	16.5	13.8	11.8	10.2	....

From this it is seen that, while the amount of excess air used with pulverized coal can be cut to a minimum owing to the nature of the fuel, it is never practical to do so when this fuel is used in boiler furnaces because of the resulting extreme temperatures. In fact, great care must be exercised to keep the excess air sufficient to hold the temperature down, as extremely high temperatures are not only detrimental to brick work, but cause considerable trouble with slagging. Generally speaking, the temperature of the furnace should run from 2,400 deg. to 2,500 deg. F. when the boiler is operating at normal rated capacity.

About 80 per cent of the air required for combustion is supplied by the fan blowing the coal into the boiler at about 1¼ to 4 oz. pressure. This is known as primary air. The remaining 20 per cent required is supplied either by the siphoning effect of the burner under blower pressure or by natural draft through secondary air openings in the setting. Such air is known as secondary air.

Conclusions.—Unfortunately, there seems to be no reliable data available on pulverized coal operation for continuous high overload capacities and using the poorer grades of fuel. There are any number of tests giving remarkable results with mechanical stokers, using low grade fuels and giving continuous high overload capacities, but such seem to be lacking in the pulverized coal field. Very high efficiencies were obtained at the Delray plant of the Detroit Edison Company under continued high overloads, some of these efficiencies running over 80 per cent., and it is reported that 76 per cent. was maintained throughout the year. This is with mechanical stokers.

The big losses in boiler furnace operation are carbon in the ash pit and stack losses. Stack losses are dependent on the amount of excess air used. With pulverized coal the amount of excess air can not be materially reduced over modern stoker fired operation because of the destructive high temperatures resulting when the amount of excess air is reduced. With pulverized coal, however, the amount of carbon in the ash pit can be reduced somewhat, but it is a question as to whether the saving in the ash pit is offset by the increased cost of preparation. The Detroit Edison Co. operate mechanical stokers with carbon in the ash as low as 10 per cent, and a gain of less than 1.5 per cent in efficiency only is shown in comparative tests.

The Schutz Crushed Coal Furnace

The Schutz Crushed Coal Furnace is a coal burning device using coal that has been finely crushed (but not pulverized) and without extracting the moisture. The crusher used is of the roll type, with magnetic separator to take out scrap iron. The coal is reduced for the furnace in the one operation of passing through the roll crusher.

The crushed coal is then elevated to a bin in front of the boilers where it falls by gravity to the feeder. The feeder is of the rotary type, carrying the coal from the chute and dropping it into an air blast where it is picked up and carried into the fire pot, where combustion of carbon and volatile takes place, with the separation of the ash and slag.

Installation Under Test.—The furnace under test at Purdue University, Lafayette, Ind., is installed under a 250 horsepower Sterling boiler. The fire pot is 28 in. in diameter at the upper lip, and 36 in. in diameter across the widest part. The coal is fed in around the periphery of the fire pot through four pipes made from 3½ in. boiler tubes.

The air (under pressure of about five inches of water) enters with the coal tangential to the perimeter of the fire pot and is carried rapidly around the inside of the fire pot. As the volatile is driven off and ignited a vortex is formed, which siphons in secondary air to complete the combustion. The ash and slag is separated while the coal is still whirling about the inside of the pot, and this slag runs out a small hole in the bottom of the pot and falls into a sealed ash pit. Secondary air is siphoned in by natural draft and the action of the vortex through doors located in the front of the setting.

Tests.—This device is installed in the boiler house of Purdue University, where it has been undergoing tests for some time. However, these tests were made to develop and perfect the burner and no evaporative tests have been run to date. Temperatures taken show that the temperature within the primary combustion chamber are about 2,800 deg. F., and over 2,900 deg. F. in the secondary combustion chamber.

Economy and Cost of Operating.—Inasmuch as this device has not yet been made a commercial proposition, no data is available as to the cost of operation and maintenance. However, it can justly be compared to a pulverized coal burning furnace in which the cost of pulverizing and drying has been eliminated. Further than this, by virtue of the method of slag separation, the higher temperatures resulting from reducing the excess air to a minimum are available without the accompanying trouble with slagging. It can be stated from personal observation that there are no slag or soot deposits on the tubes.

Because of the higher available temperatures and low carbon content in slag and ash, efficiencies as high as those obtained in

pulverized coal burning (if not higher) are to be expected. It is self evident that the cost of operation is much less than in a pulverized coal plant, and less than in most mechanical stoker plants.

The report was signed by A. C. Trumbull (Chairman), Erie; J. V. B. Duer, Pennsylvania; J. H. Davis, Baltimore & Ohio; B. B. Milner, New York Central, and L. C. Bowes, Chicago, Rock Island & Pacific.

Discussion

B. B. Milner (N. Y. C.): Mr. Trumbull was not able to be here to present the report of the committee, which has been largely his work. At a late hour yesterday he indicated to me that it would be impossible for him to be here, and asked me to represent him in the presentation of the committee report.

During the presentation of the abstract, Mr. Milner said: The committee's thought is that those attacking the subject for any group of plants on any line, should first be concerned with finding out if there is anything very radically wrong with the performances being obtained as reflected in the quantity of water evaporated per pound of coal. The committee therefore arranged Chart 5 to show the reasonable variations for the various kinds of boilers represented, the reasonable variations between what would be considered excellent performance, average, or poor performance.

C. E. Fuller: I move that the report be accepted and open for discussion.

(*Motion seconded by Mr. Chambers, put to vote, and carried*).

Chairman Tollerton: I wish to call attention to the fact that our time is up with regard to discussion for the day. The discussion on this paper, I hope, will be limited. I would like to say, however, that as expressed in the paper, the stationary boiler plant is one of the most important features to-day in the consumption of fuel. I believe that in handling this subject the committee should be continued, and made a standing committee, so that the association would have the benefit of the improved methods of modernizing stationary boiler plants.

C. E. Fuller: If there is no discussion, *I move that the report be received and printed, and the committee continued for another year.* (*Motion seconded and carried.*)

Chairman Tollerton: If there is no further discussion for the day, and as the hour for adjournment has arrived, we will adjourn until 9:30 o'clock on Thursday morning.

The Cornell Banquet

ARRANGEMENTS ARE BEING made for holding the annual Cornell banquet on Saturday evening, as in previous years. The details will be announced in a later issue of the *Daily*. Those desiring to attend should register with A. F. Stuebing at the *Railway Age* booth.

Yesterday's Entertainment Feature

THE OPENING day's entertainment features were introduced by the Albert Taylor Orchestra of New York City in the way of a morning concert in entrance hall on the pier. Let us depart a trifle from the story and say that yesterday's and last night's performances of this orchestra, which has been engaged for the entire convention, assures us of an abundance of good music while we are at Atlantic City.

In the afternoon many of the convention people enjoyed a musical program and impromptu dancing, followed by the serving of tea at 4.30 o'clock.

In the evening the first regular informal dance was enjoyed in the ballroom on the pier. The floor was filled to its capacity. Informal dress prevailed. During the intermission between the first and second parts of the program the large audience was entertained pleasingly by the figure and fancy dancing in costume of a number of Atlantic City's little girls under the direction of Joseph Dawson, amusement director of the pier, assisted by Miss Dawson. Some five or six dances were given and were greatly enjoyed and heartily applauded as a new and attractive feature of an evening of this kind.

The carrying out of the evening's program was in charge of the following sub-committee of the Entertainment Committee: L. B. Sherman, chairman; L. O. Cameron, Horace Hager, Ellsworth Haring, Langley Ingraham and W. B. Wise.

Wear Your Badge Where It Can Be Seen

YOU CAN SAVE yourself and members of the entertainment committee embarrassment if, when on the Pier, you will wear your badge where it can be seen. Persons not having badges are not entitled to be on the Pier, and if you do not wear your badge where it can be seen, do not take offense if you are asked to either show it or retire from the Pier.

New Members Interstate Commerce Commission

PRESIDENT WILSON yesterday announced recess appointments of Henry Jones Ford, James Duncan and Mark W. Potter as members of the Interstate Commerce Commission. Their nominations were sent in while Congress was in session, but the Senate did not confirm them before adjourning. The recess appointments will enable them to serve as members of the commission until the Senate meets again. Mr. Potter is president of the Carolina, Clinchfield & Ohio Railway.

Two Prominent Members Ill

TWO OF THE MOST prominent members of the Mechanical Section, J. J. Hennessey and H. R. Warnock, are unable to attend the convention this year on account of illness. At the session on Wednesday a motion was made by C. E. Fuller and unanimously carried, that the following resolution be sent to these two members:

"Mechanical Section III of the American Railroad Association, in convention assembled, regrets exceedingly your inability to be present, and extends best wishes, and hopes for your speedy recovery, and that you will be with us one year hence."

Registration Figures

UP TO THE HOUR of going to press with registration book number one (at noontime Wednesday) the following were the official figures as given to the *Daily* by Chairman Gayetty of the enrollment committee:

Members, Section 3, Mechanical	355
Purchases and Stores	9
Special guests	102
Railroad Ladies	251
Supply Ladies	354
Supply Men	1,517
Total	2,588

There is no comparative record available for Book 1 of 1919, but the total exceeds that of any previous year.

Don't Overlook the Balcony Exhibit

CHAIRMAN TOLLERTON made the following announcement near the close of the convention on Wednesday:

"The Chairman desires to announce that there has been an exhibit space provided on the balcony, around the grand ballroom. There are some very instructive and valuable exhibits in the balcony, and I particularly hope that the members will avail themselves of it. It may be that you would overlook it in the general rush of affairs, but I want particularly to call your attention to it, because the exhibitors on the balcony have made a very fine exhibit, and you should examine it as carefully as that on the main floor.

Stenographic Service at the Marlborough

FOR THE CONVENIENCE of railroad men who wish to keep in touch with their offices arrangements have been made to maintain a corps of stenographers and typists at the Marlborough-Bleinheim during the sessions of Sections III and VI. The office will be open from June 9 to 16, inclusive, and will be located in the Park Avenue Hall (Marlborough side).

The services of the stenographers and typists will be at the exclusive disposal of the representatives of members of the A. R. A., and it is hoped that the facilities provided will be used extensively and the arrangements made will enable the members to conveniently handle their correspondence while at Atlantic City.

The Track Exhibit

THE TRACK EXHIBITS which have been provided this year, while not as extensive as those of last year, are of a nature to merit the close attention of railroad men. On the Philadelphia & Reading track at Mississippi Avenue and the Boardwalk will be found a tank car exhibit which has been provided by the American Car & Foundry Company. This includes two American Railroad Association Class III tank cars, one of which is fitted with heater pipes. One end of the tank on this car has been removed in order that the arrangement of the heater pipes in the tank may be readily observed. The third car is built to American Railroad Association Class IV specifications.

A 110,000-lb. capacity Lehigh Valley hopper coal car equipped with Hewitt articulated trucks which has been in service since 1913 will also be found on the Mississippi Avenue track. This car, which was exhibited during the 1913 conventions, after a period of seven years in active service, has just been repainted in the Lehigh Valley shops, but no repairs to the car or trucks have been found necessary. All but two of the eight wheels originally applied to this car are still in service and appear to be good for some time to come. Only one journal bearing has been replaced and the absence of flange wear on the wheels and end wear on the brasses is noticeable.

A Clark dump car designed by the Clark Car Company is being shown in operation. This car has the capacity of 810 cubic ft. and 100,000 lb.

A working model showing the operation of its all metal automatic train pipe coupler is also being shown in operation by the International Couplers Company on the Mississippi Avenue track.

At the Pennsylvania electric station, Tennessee and Atlantic Avenues, the New York Central is exhibiting a Pacific type of locomotive equipped with a trailer booster for increasing the starting tractive effort of the locomotive.

Government Loans to Buy Equipment

REFERENCE WAS MADE in the *Daily* yesterday to the announcement of the Interstate Commerce Commission as to the principles which will control its action in recommending to the Secretary of the Treasury loans to railway companies from the revolving fund of $300,000,000 created by the Transportation Act. The *Daily* has now received a complete copy of the commission's announcement, and quotes from it the following which will be of interest to railway mechanical officers and the railway supply fraternity:

"It is essential that a substantial portion of the fund be put to work at once to aid in acquiring new equipment. The appropriation for this purpose will be fixed for the present at $125,000,000, to be distributed substantially as follows:

"To aid in acquisition of freight cars, $75,000,000.

"To aid in acquisition of locomotives, $50,000,000.

"Since freight cars are interchanged and enter into general use, subserving the general transportation needs of the public regardless of ownership, the commission will endeavor to apportion the $75,000,000 in such manner as will bring about the acquisition of the largest number of cars.

"The commission cannot undertake the formation of an equipment corporation or corporations, but upon presentation of a definite, well-matured and workable plan capable of application in the immediate future, it will give preferred consideration to applications for loans to or for the purpose of such a corporation. The commission believes that it is both desirable and practicable to devise such a plan in the case of refrigerator equipment, and particularly commends this matter to the attention of the railroad executives.

"The $75,000,000 apportioned for freight cars will be used primarily to aid in the acquisition of 20,000 refrigerator cars.

"The allotment for refrigerator cars will be made first to those companies which offer the largest proportional contributions to meet the advances of the government, and will be continued in the order of proportions of carrier contributions until the total of 20,000 refrigerator cars is provided for or the applications are exhausted. Other things being equal, preference will be given to loans to or for the purpose of equipment corporations supplying the needs of a number of lines.

"After providing allotments for refrigerator cars allotments for other freight cars will be made in a similar manner and with similar preferences. Where carriers, however, offer free of prior liens running gear, parts of cars or types of cars which by construction, reconstruction or re-enforcement may be converted into modern and efficient equipment at an earlier date than is possible by new construction, preference will be given to carriers making such offer.

"The $50,000,000 for locomotives will be used first to aid in acquiring freight and switching locomotives and will not be employed for passenger locomotives until and unless applications for freight and switching locomotives are met. It will be the rule to require applicants themselves to contribute at least 50 per cent of the cost of the locomotives. Other things being equal, preference will

be given to applications for loans to or for the purpose of equipment corporations. If the demand should be in excess of the allotment, with the possible exception of equipment corporations, applications for less than 25 locomotives will first be filled, 25 locomotives will be applied in order to the remaining applications, beginning with the lowest, and the remainder will be used to complete the applications so far as possible in order, beginning with the lowest. This will be done for the purpose of securing distribution of locomotives throughout the country.

"The commission will give consideration to the applications of any carriers unable to finance as much as 50 per cent of the cost of freight or switching locomotives, and for good cause shown will advance the necessary amounts before recommending loans for the requisition of passenger locomotives."

New York Railroad Club Nominates Officers

AT A MEETING LAST TUESDAY of the committee named by President H. C. Manchester of the New York Railway Club to nominate candidates for officers in 1920-1921, the following ticket was unanimously agreed upon:

For President—J. A. Droege, General Superintendent of the New Haven Railroad.

For First Vice-President—J. S. Doyle, Superintendent Car Equipment, Interboro Rapid Transit.

For Second Vice-President—F. T. Dickerson, Secretary and Treasurer, Central Railroad of New Jersey.

For Third Vice-President—F. L. Blendinger, Vice-President, Lehigh Valley Railroad.

For Treasurer—David W. Pye, President Tuco Products Company.

For Executive Member, three years—Col. Charles Hine, General Agent, Erie Railroad.

For Member of Finance Committee—George T. Cooke, President, Union Metal Products Company.

Registration, American Railroad Association, Sec. III, Mechanical

Alling, Edward W., M. M., N. Y., N. H. & H. Princess.
Allison, W. L., V. P., American Arch Co., Marlborough.
Anderson, H. P., Asst. Ch. Oper. Off., M. K. & T., Chelsea.
Ayers, A. R., S. M. P., New York, Chicago & St. L., Marlborough.
Bachman, E. L., Asst. M. M., Penn.
Balliett, H., Asst. Term Mgr., N. Y. C., Breakers.
Band, R. W., G. S. I., B. & M., Chelsea.
Barton, T. F., M. M., D. L. & W., Traymore.
Basford, G. M., Pres., Loco. Feed Water Meter Co., Marlborough.
Battley, E. R., Supt. M. P., Grand Trunk, Ambassador.
Bauer, F., M. M., C. C. C. & St. L., Breakers.
Beck, W. R., M. M., Cleveland, Cin. & Chi. & St. L., Breakers.
Bell, R. W., G. S. M. P., I. C., Marlborough.
Bennett, R. C., S. M. P., Central Div., Penn., Haddon Hall.
Besler, J. D., Asst. to Vice Pres., C. B. & O., Dennis.
Besler, W. G., Pres. & Genl. Mgr., C. R. R. of N. J., Dennis.
Biehlmeir, G. W., P. A., K. C. S., Ambassador.
Bingaman, C. A., M. Eng., P. & R., Bothwell.
Bishop, G. C., Supt. M. P., Long Island, Chelsea.
Borrell, E. A., Engr. M. P., P. & R., Bothwell.
Brandt, C. A., Loco. Heater Co., Marlborough.
Breaker, E. R., C. E., S. A. U. & C., Breakers.
Brown, F. S., M. E., Erie, Wiltshire.
Bruckert, R. H., S. K., K. & Ind. Term., Breakers.
Bryant, W. T., Rd. Foreman of Engines, H. W. & P., Princess.
Buckbee, E. J., M. M., C. C. C. & St. L., Breakers.
Budwell, Leigh, M. E., Rich. Fred. & Potomac, Marlborough.
Burton, Thos. L., C. A. B. E., N. Y. C., Marlborough.
Bushnell, F. A., P. A., G. N., Shelburne.
Bussing, G. H., G. S., Mexico North West., Haddon Hall.
Butler, W. S., M. M., C. & O., Craig Hall.
Caley, G. W., M. M., N. Y. C., Fredonia.
Carroll, J. T., S. S. M. of E., B. & O., Marlborough.
Carroll, W. P., Supt., E. B. & A. C., Whiting Fibre Co., St. Charles.
Caviston, J. C., A. R. A., Arlington.
Christian, E. R., Supt., Cornwall, Arlington.
Coddington, H. W., Eng. Tests, N. & W., Chalfonte.
Chambers, C. E., S. M. P. & E., C. R. R. of N. J., Dennis.
Chidley, Jos., S. M. P., N. Y. C., Marlborough.
Clark, Edw., Gen. Foreman, C. P. R., Arlington.
Coe, T. W., M. M., N. Y. C. & St. L., Alamac.
Coho, O. C., Asst. M. M., Penn.
Cole, F. J., C. C. E., American Locomotive Co., Traymore.
Conahan, C. F., M. M., L. V., Osborne.
Cope, E. E., M. M., Buffalo, Rock. & Pitts., Continental.
Courtney, A. S., E. M. P., Penn., Craig Hall.
Cromwell, O. C., Asst. to G. S. M. of E., B. & O., Strand.
Crownover, G. M., Oxwold Ry. Service Co., Traymore.
Cullen, T. E., M. M., Erie, Runnymeade.
Daley, W. W., M. M., N. Y. O. & W., Chalfonte.
Darden, C. M., M. E., N. C. & St. L., Brighton.
Deguire, Geo. N., Asst. Mgr. Dept. of Equip., U. S. R. A., Marlborough.
Dempster, G., M. M., Southern, Princess.
Deppe, J. A., Genl. Supervisor Frt. Car Dept., C. N. & St. P., Strand.
Desmond, D. G., M. M., Morgantown & Kingwood, Monticello.
Desmund, James Sup. Insp., Delaware & Hudson Co., Blackstone.
De Vilbies, E. B., S. M. P., Penn., Marlborough.
Dickert, C. L., M. M., C. of Ga., Traymore.
Dickson, J., S. M. P., Spokane, Portland & Seattle.
Diehr, C. P., M. M., N. Y. C., Fredonia.
Dillon, E., A. M. S., Central Vermont, Princess.
Donaldson, T. C., M. M., B. R. & P., Arlington.
Donnellan, Jos. E., M. M., Del. & Hud., Haddon Hall.
Dow, A. M., Gen. Foreman Frt. Car Rep., El Paso & S. W., Haddon Hall.
Duke, W. D., Gen. Supt., Richmond, Fredericksburg, Breakers.
Durkley, H. J., M. M., B. & O., Schlitz.
Durham, Geo., S. M. P. & C., W. & L. E., Esplanade.
Edmonds, Geo. S., Supt. M. P., D. & H., Haddon Hall.
Elsey, W. R., Asst. M. M., Penn., Worthington.
Emley, W. B., Supt. Tools & Mchy., Erie, Princess.
Ennis, J. B., V. P., Amer. Loco. Co., Traymore.
Ettinger, R. L., C. M. P., S. R., Dennis.
Flanagan, M., M. M., C. & O., Alamac.
Flavin, J. T., N. Y. C., Marlborough.
Flynn, H. A., G. A. B. S., Delaware & Hudson, Arlington.
Fowler, Geo. L., Con. M. E., Dennis.
Freeman, L. D., Asst. S. M. P., Seaboard Air Line, Kenderton.
Fritchey, F. W., M. M., B. & O., Chelsea.
Gardner, H., M. E., B. & O., Chalfonte.
Gemlo, Wm., S. M. P. & R. S., Minn. & S. L., Haddon Hall.
Geys, H. L., M. M., Virginia, Srand.
Goodrich, Max, M. M., N. Y. C., New Holland.
Gority, John, Gen. For., Penn., Calvert.
Gowland, S. I., Asst. Genl. Storekeeper, Penn., Silverside.
Graham, Chas., Jr., Lexington.
Greenough, G., V. P. in Charge of Sales, Baldwin Loco. Wks., Marlborough.
Grewe, H. F., M. M., Akron, Canon & Youngstown, Strand.
Hall, M. A., Supt. Machinery, P. C. S., Strand.
Hallett, W. K., Gen. Mgr., Bangor & Aroostook, Marlborough.
Hambley, T., M. M., C. P., Alamac.
Hammett, Philip M., S. M. P., Maine Central, Chelsea.
Hankins, E. W., Asst. Chief M. P., Penn., Dennis.
Hartley, Geo. B., Solvay Process Co., Breakers.
Haslin, H. W., M. M., N. O. G. N., Elberon.
Hass, H. P., Engr. of Tests, N. Y. N. H. & H., Wiltshire.
Hawkins, R. D., Equipment Eng., Great Northern, Breakers.
Helme, Chas. F., M. M., Lehigh Valley, Traymore.
Henry, W. C. A., G. S. M. P., Penn. Lines, Chelsea.
Herrold, A. E., M. C. B., Monongahela Connecting, Phillips House.
Hice, Geo. T., M. M., Morgantown & Kingwood, Monticello.
Hill, J. F., M. M., W. & L. E., Esplanade.
Hinckley, A. C., S. M. P., Oregon Short Line, Esplanade.
Hoke, H. A., Asst. Eng., Penn., Princess.
Holden, E. H., G. S. of T., K. C. S., Ambassador.
Hood, J. M., Supt., Akron, Canton & Youngstown, Strand.
Hope, P., G. E., Central Vermont, Princess.
Horrigan, J., S. M. P., Elgin, Joliet & Eastern, Chelsea.
Hosack, W. K., Gen. Forman, Western Maryland, Monticello.
Howe, J., Supt. Shops, B. & O., Ambassador.
Howley, T. F., Special Agt., Erie, Runnymede.
Hunt, R. B., M. M., Fla. East Coast, Sterling.
Hunter, H. S., M. M., P. & R., Bothwell.
Hyland, Chas., Mech. Supt., Toledo Terminal, Pennhurst.
Ingersoll, H. L., Asst. to Pres., N. Y. C., Seaview Club.
Jackson, W. S., M. S., Erie, Haddon Hall.
James, Chas., M. S., Erie, Alamac.
Janson, E. W., Elec. Eng., I. C., Dennis.
Jaynes, R. T., M. M., Lehigh & Hudson River, Chalfonte.
Johnson, E. A., Foreman, B. & O., Bouvier.
Johnson, F. E., A. G. S. K., B. & O., Haddon Hall.
Jones, W. T., Asst. to Eng. of Test., N. Y. N. H. & H.
Juneau, C. G., Acting M. C. B., C. M. & St. Paul, Strand.
Karibo, J. J., M. M., C. C. C. & St. L., Breakers.
Katchan, Jno. F., Jr., Div. Storekeeper, N. Y. C., Beaumont.
Kearney, A., S. M. P., N. & W., Marlborough.
Keeney, R. P., Supt., Conora Southern, Galen Hall.
Kells, Willard, G. S. M. P., A. C. L., Llewellyn.
Kendrick, J. P., Supt. Shops, B. R. & P., Arlington.
Kennedy, S. G., G. F., A. C. L., Esplanade.
Kiesel, W. F., Mech. Eng., Penna. System, Chelsea.
Kight, H. L., Spec. Rep. Purch. Dept., W. M., Monticello.
Kight, H. R., M. M., B. & O., Monticello.
Kilpatrick, R. F., Chalfonte.
Kinney, C. D., M. M., B. C. G. & R. R., Traymore.
Knox, W. J., M. E., B. R. & P., Alamac.
Kothe, C. A., M. M., Erie, Strand.
Kuhlke, F., S. M. P., Charleston & Western Carolina, Schlitz.
Laux, J. P., M. M., Lehigh Valley, Traymore.
Lawes, T. A., M. E., N. Y. C. & St. L., Deville.
Leach, W. B.
Leman, W. W., S. M. P. & C. D., Denver & Rio Grande, Brighton.
Linderman, F. A., S. M. P., N. Y. C., Princess.
Long, J. F., Dist. Maint. of Equip. Insp., B. & O. Schlitz.
Lord, Alfred W., S. M. P., Quincy & Torch Lake, Welsh.
Lovejoy, Geo. R., MM. M., Detroit Term., St. Charles.
MacRae, A., Mech. Eng., Minneapolis & St. L., Chalfonte.
McConnell, C. H., El. Eng., P. & L. Erie.
McFeatters, F. R., Gen. Supt., Union, St. Charles.
McKinsey, C. R., Mech. Repr., Am. Car & Fdry. Co., Runnymede.
McManamy, Frank, Mgr. Dept. of Equip., U. S. R. A., Marlborough.
McNulty, F. M., S. M. P., Monongahela Connecting, Chalfonte.
McSweeny, E. J., M. M., B. & O., Ambassador.
Mackenzie, J., Grand Atlantic.
Malthaner, W., S. M. P., B. & O., Traymore.
Main, D. T., S. M. P., C. P., Marlborough.
Manchester, H. C., S. M. P., D. L. & W., Traymore.

Marriott, G. A., M. M., C. & O., Haddon Hall.
Marriott, F. I., C. D., C. & O., Seaside.
Martin, A. W., Supt. of Shops, C. C. C. of St. L., Breakers.
Maxfield, H. H., G. S. M. P., Penn. System, Brighton.
Meade, P. J., M. M., Atlantic Coast Line, Chalfonte.
Meister, C. L., M. E., A. C. L., Dennis.
Mellin, C. J., American Locomotive Co., Traymore.
Miller, G. A., S. M. P., Fla. East Coast, Sterling.
Montgomery, Hugh, S. M. P., Rutland, Dennis.
Moll, George, M. M., P. & R., Netherland.
Moran, W. F., M. M., B. & O. Ambassador.
Moseley, W. S., M. E., C. C. & O., Marlborough.
Mullinix, S. W., S. S., C. R. I. & P., Haddon Hall.
Murphy, F. K., A. S. M. P., C. C. C. & St. L., Breakers.
Murray, E. A., M. M., C. & O., Craig Hall.
Naylor, F., M. M., Miss. Cent., Princess.
Needham, R. J., Mech. & Elec. Eng., G. T., Ambassador.
Nelson, R. M., P. A., C. & O., Marlborough.
O'Brien, W. J., M. M., K. & M., Haddon Hall.
Osman, H. L., S. C. D., Morris & Co., Traymore.
Ostrander, A. E., Chief Engr., American Car & Fdry. Co., Traymore.
Oviatt, H. C., A. M. S., N. Y., N. H. & H., Traymore.
Owsley, C. W., C. I., Texas Co., Traymore.
Pack, A. G., Insp. Loco., Interstate Commerce Com., Haddon Hall.
Parker, H. H., M. M., Norfolk & Portsmouth Belt Line, Sterling.
Patterson, D., M. M., Southern, Princess.
Peddle, C. R., P. A., Penn., Traymore.
Perkinson, T. F., M. M., B. & O., Schlitz.
Perrine, W. M., M. M., Cent. R. R. of N. J., Raleigh.
Pilcher, John A., M. E., N. & W., Princess.
Platt, J. G., Hunt Spiller Mfg. Co.
Pohlman, W., G. For. Loco. Shop, N. Y., O. & W., Princess.
Poole, E. P., Supt. Shops, B. & O., Haddon Hall.
Rafferty, C. D., M. M., Algoma Cent. & Hud. Bay, St. Charles.
Ralston, J. A., M. E., Union, Marlborough.
Rasbridge, R. B., S. C. B., P. & R., Dennis.
Redding, D. J., A. S. M. P., P. & L. E., Chalfonte.
Reichard, H. W., Road Foreman of Engines, L. V., Traymore.
Reickmann, Wm. H., M. M., B. & M., Chelsea.
Reigle, S. S., Mech. Eng., D. L. & W., Arlington.
Rhuark, F. W., M. S., P. & W. V., Pennhurst.
Richardson, Louis A., M. S., C. R. I. & P., Strand.
Riley, G. E., S. M. P., Mck. Conn., Marlborough.
Rink, G. W., A. S. M. P., Cent. R. R. of N. J., Strand.
Rinter, A. R., M. M., C. R. I. & P.
Ripley, C. T., G. M. I., A. T. & S. F., Marlborough.
Robertson, H. M., M. C. B., N. P.
Robinson, L., Shop Eng., I. C., Dennis.
Robinson, W. L., M. M., B. & O., Shelburne.
Roesch, F. P., Western Mgr., Standard Stoker Co., Ambassador.
Ronaldson, F., M. M., C. P., Alamac.
Ross, W. C., M. M., Copper Range, Strand.
Ryan, T. T., M. M., A. T. & S. F., Chelsea.
Sandman, A. G., M. E., B. & O., Marlborough.
Shaffer, C. A., G. S. M. & T., I. C.
Schlafge, Wm., M. Mgr., Erie, Strand.
Schmoll, G. A., D. S. M. of E., B. & O., Marlborough.
Schulenoerger, H. E., M. M., Gulf & Ship Island, Strand.
Seddon, C. W., S. M. P., D. M. & N., Traymore.
Sedgwick, E. V., Shelburne.
Seley, C. A., Pres., Amer. Flex. Bolt Co., Chalfonte.
Selloy, Samuel H., G. F. C. D., B. & A., Pennhurst.
Seiders, I. A., P. & R., Dennis.
Shaw, B. S., M. M., Durham & So., Princess.
Shay, J. M., M. M., B. & O., Haddon Hall.
Sheehy, J. Freed I., V. P. & G. M., Chi. Short Line, Marlborough.
Sherry, C. P., Supt. of Stores, Penn. Lines West, Silverside.
Shipman, H. L., Equip. Inspector, A. T. & S. F., Shoreham.
Shoemaker, H., M. S., Bangor & Aroostock, Marlborough.
Shull, G. F., M. M., C. C. & O., Marlborough.
Sible, C. G., Supt., Winston-Salem Southbound, Haddon Hall.
Simpson, James, M. M., N. P.
Sisco, G. E., M. M., Penn., Breakers.
Smith, B. H., M. M., C. R. I. & P., Flanders.
Smith, E. J., M. M., A. C. L., Osborne.
Smith, Henry J., G. C. I., D. L. & W., Princess.
Smith, J. L., M. M., P. & L. E., Princess.
Smith, J. L., M. M., Pittsburg, Shawmut & Northern, Princess.
Smith, P. F., Jr., Works Manager, Penn., Brighton.
Smith, R. D., S. M. P. & R S., B. & A., Dennis.
Smith, R. P., Mech. Eng., Ga. Atlantic & W. P., Lexington.
Smith, W. C., Asst. M. Supt., M. P., Chalfonte.
Snyder, Jos., M. M., Monongahela R. R., Princess.
Spicer, M. T., Asst. to Pres., C. & O., Marlborough.
Storey, J. W., C. D., Cent. Ga., Arlington.
Strauss, M. H., M. M., N. Y. C., Strand.
Stough, F. B., S. C. E., Roxana Petroleum Cor., Strand.
Streeter, L. P., A. B. E., I. C., Traymore.
Stuebing, A. F., Railway Age, Dennis.
Sullivan, J. J., S. M., N. C. & St. L., Lexington.
Sullivan, T. F., Shop Supt., S. P., Strand.
Sumner, Eliot, S. M. P., Penn., Brighton.
Sutherby, A., M. M., Erie, Princess.
Sweeley, E. H., G. F. L. R., Long Island, Chalfonte.
Symonds, W. E., L. E. Frank & Clarion, Alamac.
Taylor, C. S., M. M., A. C. L., Osborne.
Taylor, S. O., For. Car Dept., A. C. L., Esplanade.
Teague, A. R., M. M., M. & O., Princess.
Terrell, C. H., A. S. M. P., C. & O., Haddon Hall.
Thibaut, Geo., M. M., Erie, Osborne.
Thomas, F. H., V. P. & G. M., Bellefonte Central, Craig Hall.
Thompson, Geo., D. M. C. B., N. Y. C., Traymore.
Thompson, J. G., M. M., Lehigh Valley, Marlborough.
Thompson, W. O., G. S. P. S., N. Y. C., Marlborough.
Tollerton, W. J., G. M. S., C. R. I. & P., Marlborough.
Townsend, W. B., Pres. & G. M., Little River, Dennis.
Towner, M. E., G. P. A., West. M., Breakers.
Tracy, W. L., S. S., Lehigh Valley, Chalfonte.
Trotter, C. E., M. M., L. E. & W., Breakers.
Tutt, F. E., M. Supt. M., K. & T., Traymore.
Van Cleve, J. R., M. M., Denver & Rio Grande.
Van Mose, J. H., Vice Pres., Penn. Tank Line, Traymore.
Wade, E. H., A. S. M. P., C. & N. W., Marlborough.
Wall, H. S., M. S., A. T. & S. F., Ambassador.
Walsh, F. O., S. M. P., Ga, Strand.
Walsh, W. F., Galena Signal Oil Co., Chalfonte.
Walther, E. W., Asst. to P. A., B. & O., Haddon Hall.
Wanamaker, E., E. E., C. R. I. & P., Chalfonte.
Wanamaker, H., S. S., N. Y. C., Traymore.
Warthen, H. J., S. M. P., R. F. & P., Marlborough.
Watson, R. E., Eng. of Tests, Erie, Dennis.
Webster, H. D., Engineer of M. P., B. & L. E., Chalfonte.
Whiteley, G., A. S. M. P., C. P., Alamac.
Whitford, W. S., M. M., C. & N. W., Mansion.
Wieseckel, G. T., S. M. P., Dennis.
Wiggin, C. H., S. M. P., B. & M., Chelsea.
Wildin, G. W., Loco. Stoker Co., Chalfonte.
Williams, A. G., E. M. P., Penn., Craig Hall.
Wilson, G. M., Supt. M. P., G. T., Marlborough.
Winterrowd, W. H., Ch. M. E., C. P., Marlborough.
Wintersteen, J., M. M., Cornwall, Arlington.
Withrow, P. C., M. E., D. & R. G., Haddon Hall.
Woodbridge, H. C., Traymore.
Wood, W. D., S. M. P., Mt. Hope Min., Traymore.
Wright, R V., Railway Age, Dennis.
Wyman, R. L., M. M., Lehigh & New England, Pennhurst.
Wymer, C. J., Supt. Car Dept., C. & E. I., Chalfonte.
Yoery, H., S. M. P., G. N., Brighton.
Zwight, S., Asst. M. S., N. P., Esplanade.

Special Guests

Adamson, Geo. W., M. C. B., Interboro Rap. Trans., Haddon Hall.
Anderson, R. E., A. B. L., C. & O., Strand.
Arden, M. R., M. A., C. of G., Lexington.
Besler, George, C. R. R. of N. J., Dennis.
Besler, William, C. R. R. of N. J., Dennis.
Boon, Geo. A., Draftsman, A. T. & S. F., Chelsea.
Booth, Wm., Ch. Draf. M. P. Dept., Gould Trunk.
Bostic, M. K., Asst. to Pres., West. Md., Breakers.
Bowler, Roland T. E., S. S. M. & T., B. & O., Craig Hall.
Briggs, W. G., Official Reporter, Craig Hall.
Bunn, D. M., Asst. Supt., A. C. & S., Atlantic City N. J.
Carbis, N. J., Foreman, B. & O., Schlitz.
Cartwright, K., Asst. to E. of T., N. Y., N. H. & H., Wiltshire.
Chambers, James A., C. R. R. of N. J., Dennis.
Clark, J. P., Supvr. of Sig., P. & R.
Coffman, A. B., E. E., P. & R., Bothwell.
Coleman, D. D., Asst. M. M., Erie, Alamac.
Coleman, S. G., Asst. G. M., D. & M.
Cooper, J. H., Ex. Dept. of Equip., U. S. R. A., Chalfonte.
Crossman, T. E., Official Reporter, Craig Hall.
Dampman, Charles P., Supt. of Fuel, P. & R., Strand.
Davidson, E. H., I. C. C., Lexington.
Deeter, Harry E., G. F. M. S., P. & R.
Dow, T. W., Genl. A. B. Insp., Erie, Wiltshire.
Durham, Edwin, W. & L. E., Esplanade.
Edwards, R., Car Insp., Penn.
Eisenhauer, G., E. E., Erie, Wiltshire.
Fairhead, J. E., G. S., P. & W. V., Alamac.
Fogarty, J. J., E. S. F., A. C. L., Osborne.
Francis, G. E., Shop For., Penn.
Gibbs, J. H., For. M. P. Dept., B. & O., Bouvier.
Grant, P. H., Ch. Insp., Federal Tank Line, Regent.
Harrold, J. W., Ch. Cl. to Frt. Agt., W. J. & S.
Henson, H. F., R. F. of E., N. & W., Lexington.
Hill, F. J., Ch. Electr., M. C., Breakers.
Holder, J. W., Insp. of Loco., I. C. C., Lexington.
Hornig, N. F., Loco. Insp., Penn., 129 N. Rhode Island Ave.
Kadel, S. W., Asst. Eng., U. S. R. A., Princess.
Kaselau, E., I. of A., Erie, New Strathaven.
Keiber, Henry, Asst. For., M. P. & R. E. Dept., P. & R.
Kells, Paul, A. C. L., Llewellyn.
Kenney, A. F., Ch. Cl. D. M. M., B. & A., Alamac.
Kern, Leroy, B. & O., Strand.
Kern, Wm., For. M. P. Dept., B. & O., Strand.
Kissinger, Francis, Asst. G. B. I., P. & R.
Lewis, Edwin L., Genl. Pas. Agt., P. & R.
Merson, J. W., G. F. M. & E. D., B. & O., Schlitz.
Mimms, A. E., Ch. Draft., C. P., Chelsea.
Mitchell, Edgar B., Div. Frt. Agt., Penn.
Morris, J. E., Div. For., F. E. C., Sterling.
Morrison, W. M., Asst. Sig. Eng., N. Y. C., Breakers.
Munden, Dr. J. J., Med. Ex. Relief Dept., Penn., Runnymede.
Murphy, J. W., Gen. F. M. P. Dept., B. & A., Alamac.
Newman, W. A., Engr. Loco. Const., C. P., Haddon Hall.
Noodberg, C. R., P. & S., 1515 Pacific Ave.
O'Connor, Geo. A., Inspector, I. C. C., Haddon Hall.
Ogilvie, Jas., M. Expert, Bd. of Ry. Comms., De Ville.
Oplinger, Jack, A. C. L., Chalfonte.
Pack, A. G., Jr., I. C. C., Haddon Hall.
Parker, H. H., Jr., M. M., N. & P. Belt, Sterling.
Peters, J. C., Supt., P. & R., Holmhurst.
Peterson, W. A., Gen. Shops Eng., C. P., Haddon Hall.
Ploettner, E. F., Machinist, Penn., 19 S. Arkansas Ave.
Plummer, O. R., Reg. Marker, Penn.
Pribble, B. S., Ch. Cl. S. M. P., R. F. & P., Traymore.
Raps, J. F., G. B. I., I. C., Traymore.
Rommet, C. T., M. P. I., B. & O., Schlitz Hotel.
Scanell, A. S., Asst. P. A., Barre, Traymore.
Scull, A. W., Reg. Clerk, Penn.
Shaughnessy, T. J., Shop Acct., K. & Ind. Ter., Breakers.
Sheedy, J. A., Asst. M. M., Penn., St. Charles.
Sheehan, J. J., Foreman, N. & W., Alamac.
Shirley, John A., Asst. C. I., I. C. C., Haddon Hall.
Simons, A. M., T. E., P. S. & N., Terminal.
Skinner, Archie, A. B. F., A. T. & S. Fe, Phillips.
Smith, Archie, A. C. L., Osborne.
Smith, E. B., Sig. Supr. of Asst. Term., N. Y. C., Breakers.
Stabrook, F. C. E., R. F. E., N. & B., Elberon.
Thompson, E. B., Asst. Eng., C. & N. W., De Ville.
Tinder, F. S., Mat. Insp., Virginian, Strand.
Toomey, J. T., Ass. Shop For., Penn.
Torbeck, F. S., F. E. S., B. & O., Whittle.
Waldo, C., Insp. of Loco., I. C. C., Lexington.
Walls, Willard, Spec. Rep., U. S. R. A., Marlborough.
Warthen, H. J., R. F. & P., Marlborough.
Weigle, John, Retired For., W. J. & S., Elwood.
Wiegand, F. B., S. E., N. Y. C., Breakers.
Williams, J. D., St. Charles.

The Man Who Saw

The Daily Strike

"What's the matter—what's the matter?" questioned the scared general foreman of his boss who approached the roundhouse looking wild-eyed and pale. "Anything happened—anybody hurt?"

"H-s-s-t! Soft pedal. Come in here behind this tender and I'll tell you."

The two disappeared behind the roundhouse wall and what the superintendent of motive power told the foreman was clicked over the wire to headquarters in that same hour as follows:

"Mr. Beat M. Tooit, general manager, A. B. & C. R. R. No strike this morning. What is holding it back? What shall we do? Answer urgent. Jones."

The Good Old Days of Josh Billings

The Kronic Kicker is here again in the same old garb. He dropped in to tell the Man Who Saw that he hadn't washed his face for 24 hours because there wasn't any water on the car—and, besides, the porter had evidently forgotten the usual cake of soap. He advised friend K. K. to be charitable and not to forget the difficulties that beset every department of a railroad these days. K. K. went away muttering to himself as the Man Who Saw recalled something that the late Josh Billings is said to have expounded on the subject of Pullman cars to the effect that "the only time he ever travelled on those slumbering tanks, was when he needed a new cake of soap and some towels for the home nest." Here's to the eventual return of the good old days, K. K.!

Railroad Presidents and Time Tables

"Who is that?" asked the Man Who Saw, as he timorously followed Beelzebub in his search for a hot spot in the regions below. For The Man had died and was about to get what he expected for certain misdeeds on a railroad during a few years of his life on Earth.

"Who?" replied the Devil.

"I refer to that worried but dignified old gentleman over there in the corner on the hot grate with his hands full of apparently fireproof papers."

"Oh, that's the President of the High Dry & Windy R. R.—he died last year, you know."

"Yes, I remember," said The Man. "He sure had a fine funeral. I expected to see him here—but what is he doing?"

"Well," said his Satanic Majesty, with a gleeful grin, "he issued some horrible time-tables during his time, so we decided to get our Chicago agent to collect them and send them here. We had them all reprinted on asbestos and he has to spend several thousand years here on that grate, trying to figure them out. Every time he discovers a mistake we cut a year off of his time. If he works hard we believe we can sublet that corner to another railroad man next month."

Wasted Man Power

"Why don't they put electrically propelled wheel chairs on this boardwalk?" inquired the Man Who Saw.

"Well," replied his friend, "There's an ancient city ordinance that prohibits the employment of self-propelled vehicles on this boardwalk."

"What of that?" replied the Man, "There's just as ancient an ordinance in the City of Havana that says you can't erect a building whose height is more than 1½ times the width of the street upon which the building faces. As some of these streets are 12 feet wide, you can draw your own conclusions; seven-story steel buildings are going up there and the men who framed the law, if they are still alive, are wondering why they framed it. The wheel chair pusher is needed on the farm, at the mill; he's needed in production—they are crying for him at the mines."

"But there are only a few of them," interjected the friend, "Why worry?"

"These few typify the many who are throwing away their time and opportunities to better themselves," said the Man.

"Well," replied the friend, "Why pick on me? Why don't you try to enthuse that bunch out on the Pier who are exhibiting the neat little electric storage battery cars?"

The Weak Spot

Every convention seems to bring to the front the importance of attending particularly to the requirements of certain departments in the mechanical make up of a road. This year, The Man Who Saw seems to sense an unmistakable sentiment in favor of the rescue of the roundhouse from the dismal abyss of near-oblivion, to which, in many sections, it has fallen. It recalls one roundhouse—or workhouse, rather—in the West where he, ambitious to continue eating regularly, accepted a job on the night-shift. The work started at 7 p. m. and ended at 7 a. m., provided there wasn't an ounce of pep left in the tired and smoky force; in which case they could work until they dropped dead. This roundhouse, like many of the others of that day and this, hadn't had a new idea since they removed the diamond stacks and brass jacket bands from boilers. Jacking up an engine for a spring repair or something else, meant a search in the dark for two kinds of jacks—a pair for the pilot beam and a pair for the tail brace. The jacking up was the least part of it—finding the jacks was a man's job; finding a truck to drag them on, was two men's job. And they called it a roundhouse! An engineer, dissatisfied with his headlight, persuaded the night foreman by means of a night roundhouse cigar, to change his dynamo set and the Man Who Saw was instructed to take, whichever way he could, over two hundred pounds of headlight efficiency off of an engine and put it on another. But the rope on the block and tackle was frazzled. A new rope was procured but a sheave was "froze" tight. Why go on? The tale is endless! That job wasn't ready at 7 a. m. and the Man Who Saw got hell. And the S. M. P. chewed his cigar and growled at the maintenance report as he decided to visit that roundhouse and fire the whole gang.

After the S. M. P. Went Home

The motive power offices had calmed down for the day. The daylight-saving clock on the wall said it was 8, but the incoming train from Poseyville proclaimed it was 7—and the private office of the "old man" was deserted. Papers were left as they were, ready for a resumption of the struggle of to-morrow.

The beautiful engraving of No. 50, the old faithful, a pioneer 4-4-0 with its long pilot, brass jacket bands,

elaborate bell and headlight brackets and diamond stack, no longer occupied its position over the old man's desk. Instead, the relentless cruelty of time and man's fickleness had relegated it to a distant corner. In its place hung a large and neatly framed photograph of No. 787, the line's latest acquisition, a 150-ton Mikado with all the trimmings of 1920. It was a beauty in the fullest sense of the word and No. 50 felt its presence and prominence keenly. The silence became intense and something had to happen. It was the voice of the Mikado who spoke.

"You," said the voice in the frame of the big fellow, "are a piker, a has-been. You are a weak sister. You thought more of beauty than of strength. Look at me, I shake my grates myself, I feed my coal to my firebox and I'm particular about my steam—I get mine superheated; you get yours wet. I reverse myself. Look at my headlight—I could wither you by its glare! Why you haven't even got an injector. When you got thirsty you had to drop your train and run. Look at me and wonder, you shrimp!"

"I *have* been looking at you and wondering," replied No. 50 from its corner, "and I am sorry to say that you forget who you are; you are my grandson. Now, you are doing fairly well and I gladly resign my place in the old man's affections to you, but remember this:—I'm your ancestor. The men who made you, learned on me. I taught them the necessities of the improvements they hung on you—and they are going to hang on more. It's about time for you to dignify your unrestrained conceit with the addition of a feed water heater. If you don't, the old man will take you down and put you over here with me!"

The Prune Plan

The Man Who Saw is pleased to print the following letter in the hope that it will cheer the hearts of those modest ones who have long and secretly cherished the idea which it sets forth:

JUNE 10, 1920.

THE MAN WHO SAW,
Care Young's Million Dollar Pier, Atlantic City, N. J.

DEAR SIR.—Knowing you to be a friend of the working man and anxious to give publicity to any movement whose adoption would tend to raise the level of the worker from his present lowly sphere, I enclose you an outline of a bill which it is hoped will be introduced in Congress at its next session and forthwith enacted as a law. Briefly, you will observe that the main purpose of this somewhat original document advocates the turning over of the railroads to the Railroad Supply Men's Union, of which I have the honor to be the secretary.

As you know, we have struggled for years against the whims and conservatism of superintendents of motive power, master mechanics and the rest of the mechanical oracles in the hope of making them see the light—and with little success. The bill proposes that the Supply Men's Union be given entire charge of the maintenance and operation of the lines, in return for which privilege the members offer their services, free of charge. This provision, you will readily agree, offers an unprecedented possibility of economy in the immediate abolition of millions of dollars in salaries. Think of it! Wow!

And consider the transformation that would take place! With "Modernize" as our slogan, we would soon have the equipment in this country in such shape as to exceed our most sanguine expectations! Ponder, if you will, upon the delightful sensation which would be ours in the exercise of a free hand for the good of the roads, instead of sitting out on the doormat for hours, as we often do now, wondering if they will let us in.

Trusting that you will lend your support to this worthy cause and will be able to give it a place in your columns, I am,

Yours for progress,

HUM DINGER,
Secretary, Railroad Supply Men's Union.

Conventionalities

If you want any information on how to build up worn flanges with electric arc welding see E. Wanamaker, electrical engineer, Rock Island.

The Ostrander twins, Doris and Dorothy, daughters of A. E., are again with us. Last year is the first convention they missed since they were born in September, 1909.

Louis J. Alerding, traveling storekeeper for the Chicago & Eastern Illinois since the creation of the position three years ago, has been appointed general storekeeper, with headquarters in Danville, Ill.

George A. Bardon, genial sales manager of the Duntley Pneumatic Tool Company, with Mrs. Bardon, arrived Sunday and registered at the Shelburne. This is Mr. and Mrs. Bardon's twentieth convention.

D. J. Redding, assistant superintendent motive power, of the Pittsburgh & Lake Erie arrived Wednesday morning. He is convalescing from a severe illness, but seems to be well started on the way to complete recovery.

Harry Passmore, of Grip nut fame, former railway man, is accompanied this year by Mrs. Passmore and Harry E. Passmore, Jr., their son, who is a sophomore at Lehigh University. They are quartered at Chalfonte.

Many friends of Mr. and Mrs. D. C. Noble, of Pittsburgh, will miss the presence this year of these estimable people. Both Mr. Noble and Mrs. Noble died during the past winter. They attended the conventions many years.

George Bussing, general superintendent Mexico & Northwestern, also in charge of motive power and equipment, with headquarters at Juarez, Mexico, accompanied by Mrs. Bussing, arrived yesterday and registered at Haddon Hall.

News was received at Atlantic City yesterday of the dangerous illness of W. P. Pressinger, vice-president of the Chicago Pneumatic Tool Company. Mr. Pressinger is a patient at the Roosevelt Hospital in New York, where he was operated on this week for a serious ailment.

S. C. Dinsmore of The National Refining Company had expected to attend the convention, but at the last moment found he could not get away. George C. Hannaway of The National Refining Company has taken his place on the transportation committee.

Bruce Owens, of the transportation committee, doesn't quite recognize himself. He thought he was assistant to the first vice-president of the Magnus Company, but the official booklet shows him as being with the Maginnis Company.

Frank McManamy, manager of the department of equipment, Division of Liquidation Claims, motored over from Washington on Tuesday with Mrs. McManamy, who is attending her second convention, and with his assistant, George N. DeGuire. They left Washington at eight o'clock in the morning, stopped at Baltimore for about an hour and made two wide detours, arriving at Atlantic City about six o'clock in the evening.

L. D. Freeman was the first of the Seaboard Air Line men to arrive. Mr. Freeman has been promoted to the position of assistant superintendent of motive power since last year, but is still in charge of the mechanical engineer's office on the Seaboard.

Mr. and Mrs. Joseph Chidley are registered at the Marlborough-Blenheim. Mr. Chidley is superintendent of motive power New York Central lines west of Buffalo. Miss Helen Chidley, their daughter, is also here and is greatly enjoying her first convention experiences.

Frank J. Foley comes to the conventions this year as vice-president of the Railway Steel Spring Company. He was appointed general sales manager a short time before the conventions last year, following the death of S. T. Fulton, who had been vice-president in charge of sales.

J. D. Besler, assistant to the vice-president of the Chicago, Burlington & Quincy, is expected to arrive in Atlantic City on Friday with his son, W. G. Besler, president of the Central Railroad of New Jersey. Mr. Besler, Sr., is 87 years old and is looking forward to his visit with a great deal of interest.

W. L. Greaven, superintendent of rolling stock of the Buenos Aires Great Southern, told a representative of the *Railway Age* the other day in Buenos Aires, that he would be "among those present" at this year's mechanical conventions. Mr. Greaven will be accompanied on this little ride of 5,000 miles or so by Mrs. Greaven.

Secretary Hawthorne is accompanied this year by his wife and their 16-month-old daughter, Olive. This is Mrs. Hawthorne's first convention and she seems to be getting a lot of solid enjoyment out of it. The two older children, Margaret, six years old, and John, nine years old, are at home, but will probably attend the convention next year.

Chairman W. J. Tollerton of the Mechanical Section, is accompanied to the conventions this year by Mrs. Tollerton and daughter, Frances Lee. Mr. Tollerton speaks enthusiastically about the large business the Rock Island is handling, and about its prospects if the railways of the West are given a reasonable advance in rates. He was the recipient yesterday of many compliments on the thoughtful and able address he delivered in opening the convention.

Captain Frank H. Burr, director of the Cleveland Pneumatic Tool Company's foreign department, told the *Railway Age* representative in Buenos Aires the other day that he would wait for a good boat to come home on —and he did. He returned on the S. S. Vauban, one of the Lamport & Holt New York-South American liners. Captain Burr is full of two things—pep and straight South American information. His pep is inspiring; the information is educational.

During the past year the Bureau of Locomotive Inspection has conducted a large number of tests on many roads to determine the correctness of the indications of the water glasses and gage cocks. Mr. A. G. Pack, chief of the bureau, has brought some of the data with him to the convention. Railroad men who have been accustomed to thinking of the gage cock indication as being correct under all conditions are greatly surprised when they learn that Mr. Pack determined that the gage cocks sometimes show water eight inches above the true level in the boiler. The complete data is now being compiled and will be issued by the Bureau within a short time in the form of a booklet.

Robert S. Collett, superintendent of fuel and locomotive performance on the New York Central lines, was one of the early arrivals at the convention. Mr. Collett is enthusiastic over the immediate prospect of getting a fuel instruction car going on the railroad with which he is now connected. It is understood that this will eclipse anything in the way of fuel instruction cars that have ever been put out. There are other phases of the fuel situation on his railroad about which "Bob" is enthusiastic and it looks as though the good work initiated by the Fuel Conservation Section is not only being perpetuated, but will be augmented on the New York Central.

Among the arrivals yesterday was H. M. Perry, who may perhaps be the holder of the record of attendance at these conventions. Mr. Perry attended the organization meeting of the Master Car Builders' Association at the old Massasoit Hotel, Springfield, Mass., in 1867, and joined the association in 1869. Since that time his attendance has been almost constant. The *Daily*, at this late date, is rather surprised to learn that Mr. Perry is a direct descendant of Commodore Oliver Hazzard Perry, of Lake Erie fame. In this connection it may be stated that a grandson of H. M. Perry is now in the Naval Academy at Annapolis. Mr. Perry has been on the staff of the Edwin S. Woods Company for many years and has been called the father of the side bearing industry.

"Dick" Naylor, of the Symington Company, comes to the conventions this year with callouses on his hands, which have been acquired, not in the practice of the gentle art of hitting the elusive golf ball, but in the more practical work of building a garage. He decided in the spring to personally build a garage at his home in Chicago. He thought it would be the work of only a few holidays, Saturdays and Sundays. It proved to be a bigger job than he thought. His experience, however, was like that of Tom Sawyer in whitewashing the fence. The work of building a garage as performed by him looked so attractive to some of his friends that he began to receive proffers of assistance. His help since then has included several of his neighbors and friends, including Major Bill Allison and Gene Clifford, of the Santa Fe. The garage is now about finished, but up to the present time the work of construction has prevented Dick from playing any golf.

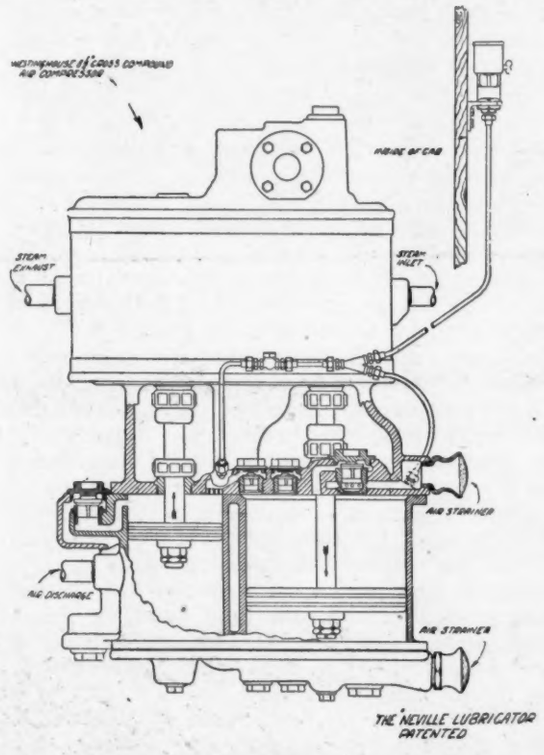
A. P. Van Schaick, assistant general sales manager of the American Chain Company, with headquarters in New York, is attending the conventions for the first time. Mr. Van Schaick has long been in the railway supply business, but until recently was district sales manager of the Lackawanna Steel Company at Chicago. He was for years active in the affairs of the National Railway Appliances Association, which gives the exhibit in connection with the annual convention of the American Railway Engineering Association in Chicago, and in 1914 was president of the Railway Appliances Association. He went with the American Chain Company early in 1919 and was made assistant general sales manager in New York just about a year ago. He is especially interested in developing the business of this company in the railroad field and this is the first year that it has made an exhibit at the conventions here. Mr. Van Schaick is as enthusiastic about the game of golf as he is about the game of business. He was for years a leading member and chairman of the membership committee of the Exmoor Country Club of Chicago, and since moving to New York he has joined the Scarsdale Country Club.

New Devices Among the Exhibits

The Neville Lubricator

WITH THE ADVENT of the 8½-in. cross-compound air compressor the problem of lubricating the high pressure air cylinder presented itself, and various devices have been brought out to solve the difficulty. The Neville Lubricator Company, Pittsburgh, Pa., is now manufacturing the Neville lubricator, which is specially designed to meet this situation. Due to the fact that there is a constant pressure of about 45 lb. in the high pressure cylinder it is obvious that oil for lubrication will not enter the cylinder by gravity, nor can it be taken in by suction; pressure is the only agency for introducing the oil. The action of the compression stroke of the low pressure cylinder is successfully utilized by the Neville lubricator to force oil into the high pressure cylinder.

A neatly designed cup, holding one-half pint of oil, is attached to the left side of the boiler head by means of



Lubricator Applied to Cross Compound Air Compressor

a short iron bracket and one stud bolt, with ¼-in. copper tubing running beneath the jacket to the pump. This pipe then enters the upper opening of a brass "Y", located just above the low pressure air cylinder, and is continued from the lower opening of the "Y" to the opening in the low pressure cylinder. The piping is also carried to the opening in the high pressure cylinder, through a brass horizontal check valve, which prevents back pressure from the high pressure cylinder.

The cup itself consists of two chambers, the upper one termed the reservoir and the lower the well. These are connected by a one-inch section of ordinary lubricator glass. An adjusting screw with jamb nut is used for regulating the amount of oil allowed to pass into the well, and this amount corresponds to the quantity drawn into the pump in the same given time. A wing valve at the side of the cup allows the feed to be shut off entirely (when the pump is stopped) and opened at will, without disturbing the adjustment.

The oil is retained in the well by a check valve in the bottom connection and this is opened by the action of the suction stroke of the low pressure cylinder, a small quantity of oil being drawn into that cylinder through a port of proper size. This oil is broken up into spray by passing through a choke drilled with fine holes at the bottom of the cup, where it connects with the tubing. A portion of the oil is taken into the low pressure cylinder on this stroke and on the compression stroke the remainder is driven back through the "Y" and the line check valve into the high pressure cylinder. As this check closes with the suction stroke of the low pressure cylinder none of the oil can return from the other cylinder, while the check in the cup prevents its return to the well on the compression stroke.

This lubricator will hold sufficient oil to permit making the longest trip without refilling en route, and it needs no attention whatever outside of closing the wing valve when the pump is shut down. It has been successfully tested out on a number of roads, there being one record of a pump which gave 19 months' continuous service before it was taken down for an examination that disclosed perfect condition throughout. The Neville lubricator is being exhibited by L. W. Garratt, Pittsburgh, Pa.

Improvements in the American Automatic Connector

CERTAIN IMPROVEMENTS designed to overcome objections to universal automatic train pipe connection have recently been made in the automatic connector manufactured by the American Automatic Connector Company, Cleveland, Ohio. To facilitate the changing of air gaskets while cars are coupled, the portion of the freight connector head that supports the gasket and forms the air port from the hose to the face has been made removable. The removable portion is securely held in position by a key. Releasing the key permits this part to be withdrawn from the head entirely, when the old gasket can be removed and a new one inserted.

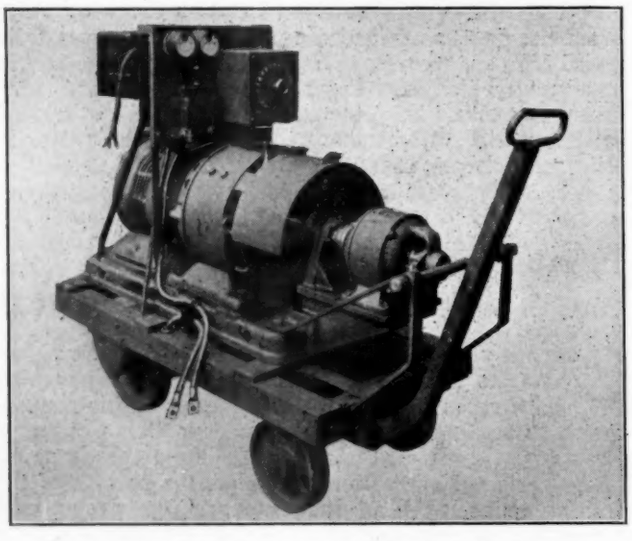
The freight interchange adaptor has been made a part of the head, being attached to the upper portion by means of a rotating link. When not in service it is thrown around behind the head, where it is always available. The link and key method of securing the adaptor in service position has been supplanted by an over-center lever which simplifies the construction materially.

To overcome the necessity of using a heavier spring in the passenger head than in the freight head to compensate for the steam line pressure, a locking device has been provided on the passenger head. This lock consists of a projection on the bottom inside face of the ring and a corresponding depression on the bottom face of the pyramid or cone. In coupling, the projection is drawn upwards into the depression by the upper face of the pyramid, thus firmly locking the connectors together. The capacity of the passenger spring and freight spring can therefore be made the same.

Single-Operator Electric-Welding Outfit

THE SINGLE-OPERATOR ELECTRIC ARC-WELDING EQUIPMENT manufactured by the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., is claimed to be exceptionally efficient because the generator operates at arc voltage and no resistance is used in circuit with the arc. The generator is designed to inherently stabilize the arc, thereby eliminating the necessity for providing automatic moving devices such as relays, solenoid control resistors, etc. These not only increase the cost of investment and maintenance, but may not be quick enough in action to follow the instantaneous changes of the arc circuit. The generator of the set has a rated capacity of 175 amperes, and is provided with commutating poles and an exceptionally long commutator which enables it to carry the momentary overload at the instant of striking the arc without special overload protection.

The design of the control is such that very close adjustment of current may be easily and quickly made, and once made, the amount of current at the weld will remain fixed within close limits until changed by the operator. There are 21 steps provided from 50 to 225 amperes. This gives a current regulation of less than 9 amperes per step which



Single Operator Electric Arc Welding Equipment

makes it much easier for a welder to do vertical or overhead work often encountered in railroad shops. Due to the special design of the generator and its exciter, it is unusually easy for the operator to strike and maintain the arc. Although the generator is strictly a short-arc machine, the arc produced is tenacious and causes the deposited metal to penetrate deeply into the work. These features are extremely desirable as they make it easier for a new operator to learn to do welding work and enable experienced welders to accomplish more in a working day.

The generator is mounted on a common shaft and bedplate with the motor. A pedestal bearing is supplied on the commutator end which carries a bracket for supporting the exciter. The latter is coupled to the common shaft of the set by means of a special coupling. Motors can be supplied for either direct or alternating current circuits. Where an alternating current motor is used leads are brought outside the motor frame for connecting for either 220 or 440 volt circuits. An electrician can change these connections in a few minutes' time. This feature is particularly desirable on portable outfits which may be moved from one shop to another having a supply circuit of different voltages. Ball bearings are used on the single operator motor generator set.

Where the equipment is required for portable service, the motor generator set with the control panel is mounted on a fabricated steel truck, equipped with roller bearing wheels. The portable equipment can be easily hauled about the shop or yards by one man. Suitable plugs and receptacles for three-phase, three-wire or two-phase, four-wire, alternating current motors allow the set to be quickly and conveniently connected to the supply circuit at any desirable point. Only one plug is required for the motor, but the number of receptacles required depends upon the number of points at which it is desired to do welding work. These plugs and receptacles are supplied on special orders.

Control for the single operator equipment consists of a small ebony asbestos panel, mounted upon angle-iron framework. The field rheostat for regulating the welding current, voltmeter, ammeter and two-pole knife switch are mounted upon the panel. The motor generators are supplied in capacities of 300, 500, 750 and 1,000 amperes and are of standard Westinghouse design and construction. The generator is compound wound, flat compounded, i. e., it delivers 60 volts at no-load and also at full-load.

The motor and generator are assembled on a common shaft and mounted compactly on a bedplate and the 300-ampere capacity sets can be supplied either portable or stationary. The sets of capacity above 300 amperes are usually used as stationary sets. Sets of 500-ampere capacity are frequently arranged for portable service but are more readily handled by means of a crane than by mounting on a truck.

In using the multiple operator equipment each operator is provided with a separate control or outlet panel so that each may take current from the same generator without interference. For convenience multiple operator equipments are divided into class 1 and class 2 equipments, depending upon the type of control supplied. The class 1 equipment has the main control panel arranged for the control of the generator and one welding circuit. The panel is made up of a single section upon which are mounted indicating instruments, protective apparatus and switches for adjusting the welding current. If additional circuits are required it is necessary to use separate outlet panels. The class 2 equipment has a main panel similar to class 1 except that it controls the generator only and separate outlets are used for all operators.

Each outlet panel consists of a slate panel on which is mounted a circuit breaker, line switch and the necessary single pole resistance adjusting switches for regulating the heat at the arc by varying the amount of current supplied. These outlet panels may be supplied for either metal or graphite electrode welding or both and may be operated simultaneously and independently of each other, the only limit being the capacity of the generator.

A metal or graphite electrode holder is supplied with each welding panel, according to the work for which the panel is designed. The holders are of light weight, well balanced and so designed that they may be used continuously without overheating. Hoods or shields, provided with colored lenses are supplied for the protection of the operator.